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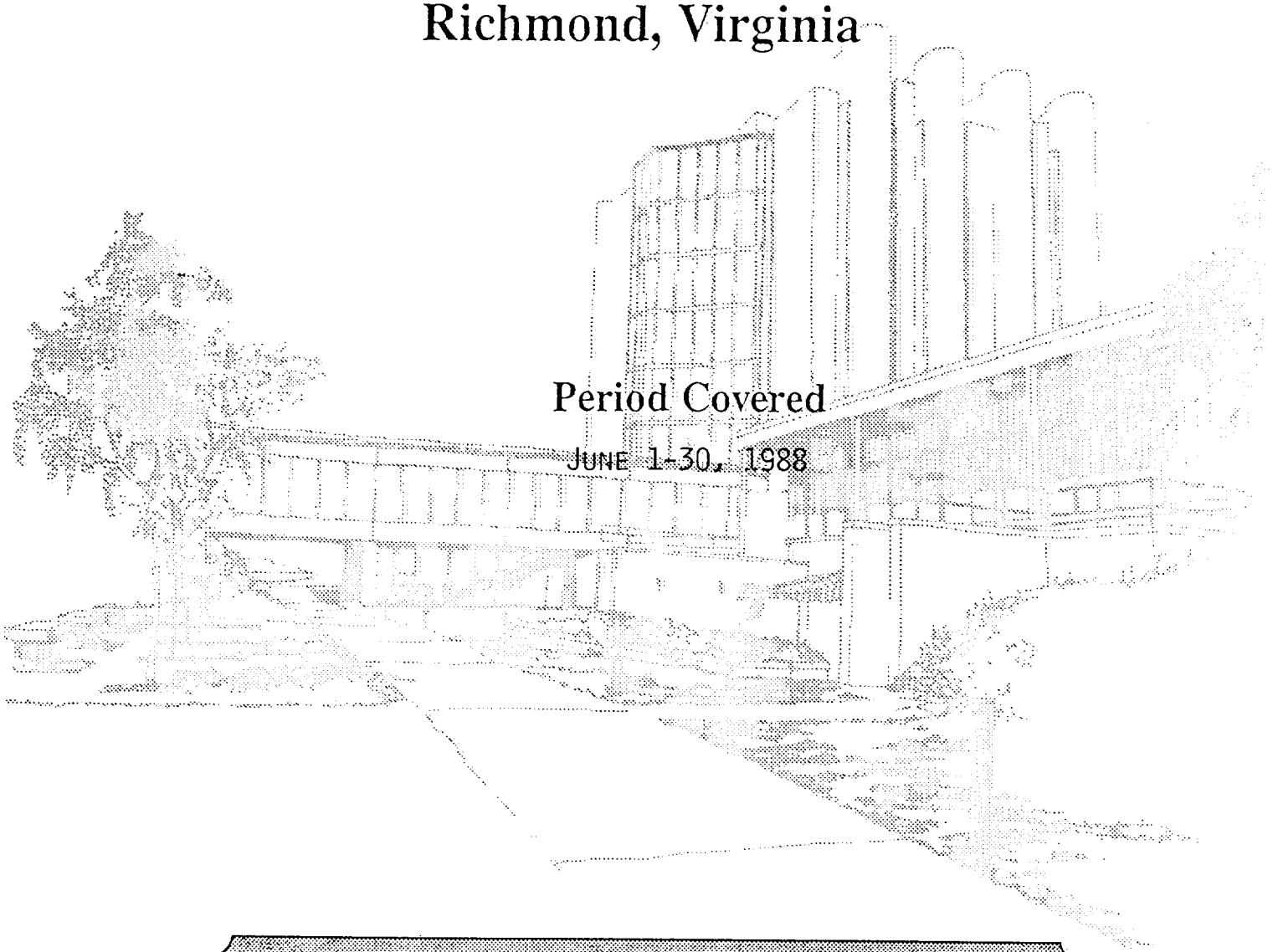

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JUNE 1-30, 1988

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*N/R = No Report

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PROJECT NUMBER: 2100
PROJECT TITLE: New Product Innovations
PROJECT LEADER: C. J. Campbell
PERIOD COVERED: June, 1988

I. PROJECT HUMIDOR

A. **Objective**: Develop a moisture release device for use inside a cigarette pack which maintains the Pack OV at the desired level.

B. **Status**: An initial test using permeable rather than microporous material (Celgard) for the moisture control device has been completed. Results indicate that this film may be as effective in allowing water vapor transfer as the Celgard material is, but at only a fraction of the cost. Further tests are planned.

The patent application is now in the final stages of preparation by the patent attorney prior to filing.

C. **Plans**: Activities continue in an effort to develop production capability for the moisture control device. Klockner Packaging has been given samples of foil for machine setup. Reynolds Metals is now in the process of making the foil laminate. The Celgard material is on hand. Production of packets is targeted for late July. The Flavor Center will prepare the solution to be used by Klockner. Modifications to a packer to handle the M.C.D. are being done by Engineering and are expected to be complete in August.

II. EMBOSSING CONCEPTS

A. **Objective**: Explore the potential advantages of embossing cigarette paper, tipping and plug wrap for both cost savings and aesthetic appeal.

B. **Status**: The lab embossing unit has been turned over to Engineering for their development work. A conceptual design for a replacement unit has been completed and quotations for construction are now being sought.

III. KAYMICH MENTHOL APPLICATOR

A. **Objective**: Determine the effectiveness of a Kaymich direct menthol applicator as an alternative mentholation process.

B. **Status**: We are awaiting the receipt of the Kaymich system from England for installation and testing on a cigarette maker in the Semi-Works. A testing plan has been written.

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IV. TOW SUPPLIER MENTHOL PROGRAMS

A. **Objective**: Coordinate research activities of tow suppliers on menthol topics of interest to Philip Morris.

B. **Status**: Celanese is preparing an exclusivity proposal for our review on the mentholation of tow prior to or during baling in order to improve menthol delivery. Experimental work by Celanese on pre-loading tow with menthol is on hold until an agreement is reached.

Eastman is proceeding independently of Philip Morris with an experiment to study the effects of ageing on menthol delivery of cigarettes. They will provide us and others with the results when they complete their study.

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PROJECT NUMBER: 2105
PROJECT TITLE: Filter Development
PROJECT LEADER: W. A. Nichols
PERIOD COVERED: June, 1988

I. FILTER MATERIALS, LTD.

A. **Objective**: Develop polypropylene tow that is equivalent to cellulose acetate.

B. **Results**: A specially designed pump in the wax application system failed due to the low viscosity of the wax. A higher viscosity wax and different pump design are being evaluated.

Sample filters were produced for shipment to Brazil and for testing on a Philippine model.

C. **Plans**: Operating conditions for the wax application system will be established.

II. NEW FILTER CONCEPTS

A. **Objective**: Develop unique products using novel filters.

B. **Results**:

Modified Plastic Filter: Samples were remade with 50% and 60% rear band dilution for shipment to E.E.M.A. Internal subjective testing approved the product for shipment. As soon as analytical data is received, the samples will be shipped.

C. **Plans**: An alternate method for flute blockage of the plastic filter is being investigated.

III. MENTHOL ON FOIL

A. **Objective**: Support the introduction of menthol on foil process.

B. **Status**: A second ethanol emission study was conducted in Louisville. Samples are being analyzed.

C. **Plans**: Produce samples as requested. Test the third mentholator when fabrication is completed.

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PROJECT NUMBER: 2304
PROJECT TITLE: Flavor Development - New Products
PROJECT LEADER: Barbara G. Taylor
PERIOD COVERED: June, 1988

I. BONDED ENDS

A. Objective: To reduce the loose end defect level in PM products utilizing the bonded end technology without altering the subjective quality.

B. Status: Foamed Ends Retention - Results of subjective evaluations, indicated that a 4% NaCMC/2% licorice solution applied to Merit 100's cigarette rod ends at 6:1, 8:1, and 10:1 foam expansion ratios was significantly different from the control.

Ink Jet Application - Results of subjective evaluation, indicated that the models tested [2.6% NaCMC, 2.6% NaCMC/0.13% tobacco solubles, 2.6% NaCMC/0.21% $Ca(NO_3)_2$] were significantly different from the control.

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PROJECT NUMBER: 2305
PROJECT TITLE: Flavor Development-Brand Modification-Menthol/Distinctive
PROJECT LEADER: H. M. Maxwell
PERIOD COVERED: June, 1988

I. ALTERNATIVE FLAVORS:

A. Objective: To identify and qualify alternative sources for flavoring materials.

B. Status: An alternate vendor of block licorice is currently being considered. Semi-works cigarettes were produced and released for testing on the Cross-Operations panel. Cigarettes for POL testing of another flavor alternative are being produced in Semi-works this week.

C. Plans:

Cross Operation Mail-Out Panel Results	July, 1988
Cigarette Production For Modified Flavor POL (Merit 85)	June, 1988

II. PROJECT MOOG:

A. Objective: To develop the expertise to produce cigarettes that are subjectively equivalent to Salem, Newport and Kool.

B. Status: Development work to gain subjective advantage is in progress. A paired comparison POL testing N-type cigarettes versus Newport was requested. It will utilize menthol application II.

C. Plans:

Flavor Development for Subjective Advantage	June/July, 1988
N-type POL (Cigarette Making)	June, 1988

III. PROJECT LEVO:

A. Objective: To determine the subjective differences between 100% natural and 100% synthetic menthol and to develop flavors to make them subjectively equivalent so that manufacturing would have complete flexibility to use them at any ratio.

B. Status: Merit POL retesting of 100% natural vs. 100% synthetic menthol is being closed out. Data will be combined with that of Test I in order to better define subjective differences.

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C. Plans:

POL Results	June, 1988

IV. MENTHOL RELEASE COMPOUND:

A. Objective: To develop a mentholated charcoal-filtered cigarette utilizing a menthol release compound.

B. Status: Additional cigarettes were made utilizing the foam bound rod process to apply MGC. Menthol levels of these cigarettes were found to be unacceptably low. Reasons for MGC application problems are being considered and a remake will be scheduled.

C. Plans:

Cigarette Remake	To be scheduled

V. LOW TAR CIGARETTE DEVELOPMENT

A. Objective: To develop low tar cigarettes with the subjective character of higher tar cigarettes.

B. Status: Semi-works cigarettes were produced to evaluate the radically different blend concept. Although analytical results were disappointing, subjectives seem promising. Cigarettes have not been produced yet for the flavor concept.

C. Plans:

Cigarette Production	July, 1988
Internal Testing	July, 1988

VI. ALTERNATE HUMECTANT PROGRAM:

A. Objective: To develop the capability to produce cigarettes that are glycerin-free and cigarettes that are propylene glycol and glycerin-free, while maintaining product subjective integrity.

B. Status: G-free POL cigarettes will be remade. Models for the PG/G-free program were requested.

C. Plans:

G-free POL Remake	July, 1988
Semiworks PG/G-Free Cigarette Production	July, 1988

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VII. PROJECT FAMOUS:

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A. **Objective**: To optimize US export Chesterfield, and from this basis, define guideline specifications for Chesterfield worldwide.

B. **Status**: Two prototypes with special casings and flavors were developed on-site at FTR, and were consumer tested in Switzerland. Both showed parity with the local brand. Famous IIA was selected for POL testing here versus Camel 84mm.

C. **Plans**:

POL Testing of Famous IIA versus Camel	July, 1988
Continued Product Development	Ongoing

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PROJECT NUMBER: 2306
PROJECT TITLE: Marlboro Standardization and International Support
PROJECT LEADER: Janet L. Spruill
PERIOD COVERED: June, 1988

I. MARLBORO STANDARDIZATION

A. **Objective**: Analytical and subjective evaluations of production Marlboro KS/LS.

B. **Status**: May 12 factory pick-up under evaluation.

C. **Plans**: Three factory pick-ups scheduled between June 30 and July 19, 1988.

II. DOMESTIC CIGARETTE DEVELOPMENT PANEL

A. **Objective**: To provide subjective direction for programs within R&D and manufacturing locations.

B. **Status**: Twenty-three panels completed during the reporting period as well as profiling of Doral, Doral Lights and Merit Menthol challenge samples.

C. **Plans**: Provide assistance as needed.

III. PROJECT NATURAL

A. **Objective**: To develop 85 mm full-flavored and lights prototypes using blend components and flavor systems which will provide a natural blended product.

B. **Status**: Three POL's have been made using flush CA filters. The POL's (4432, 4433, 4434) are targeted for 8-9 mg tar using the Virginia, Virginia/Oriental and Blended blends. Each will be tested against each other. Two full-flavored models using the Blended blend and natural flavoring components for the casings and aftercuts were completed and appear to be smoking well.

C. **Plans**: Complete analytical and subjective testing on POL models.

IV. FLAVOR RESOURCE DATA BANK

A. **Objective**: Creation, customization and maintenance of flavor resource and data files for use by Flavor Development Division.

B. **Status**: Training of new individual continues. Thirty-eight vendor samples were evaluated subjectively during the reporting period.

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C. **Plans**: Division updated with information.

V. INTERNATIONAL SUPPORT

International Brands Smoking Panel

A. **Objective**: Subjective evaluations (rod aroma and smoking characteristics) of cigarette brands in the international market.

B. **Status**: Ten panels completed as well as evaluations of Salem and Salem Lights from the United States, Malaysia, Singapore, Hong Kong and Taiwan. 80 mm and 85 mm Mild 7 samples were profiled along with Capri Regular and Menthol from the United States and Malaysia.

C. **Plans**: Provide assistance as needed.

PROJECT LIGHT/ULTRA

A. **Objective**: Develop cigarette models at 4, 6 and 8 mg with a new blend and flavor system.

B. **Status**: Models for Danchi testing completed. Control samples use P.M. Super Lights filler constructed to produce a 7 mg and 5 mg tar. Test models are using Target blend, two different total blend casings and two aftercut systems with one being at 7 mg tar and the other at 5 mg tar.

C. **Plans**: Complete C.I. and subjective evaluations for release to Danchi Panel.

PROJECT SWEET

A. **Objective**: Development of a distinctively sweet cigarette for the Japanese market.

B. **Status**: Sweet flavors supplied for Project Sugar under evaluation.

C. **Plans**: Flavor development will continue.

PROJECT MOUNT ULTRA-JAPAN

A. **Objective**: Explore the use of new blends, new flavor systems and different construction styles. Cigarettes will be in the low and ultra-low category for the Japanese market.

B. **Status**: Three cigarette models have been made. Control model used PMSL filler and two test models used fillers from previous Mount Ultra series. Construction used will produce models in the 3-4 mg tar range in combination with a special cigarette wrapper.

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C. **Plans**: Complete CI and subjective evaluations.

PROJECT AVALON

A. **Objective**: Development of casing and aftercut systems for a regular and mentholated product for the Asian market.

B. **Status**: Models have been made using blend designed for the program. A total blend casing was used. Fourteen models were produced (ten regular and four menthol aftercuts). Three additional cased and uncased models will be made for further development work.

C. **Plans**: Subjective evaluations of models made and continue the development of casings and aftercuts for the program.

NEW PRODUCT IDEAS

A. **Objective**: Develop cigarette flavors to meet demands of concept ideas for different markets.

B. **Status**: Three models were made for Project Incense, two models for Project Coffee and nine models for Project Sugar.

C. **Plans**: Evaluation of models made and development of additional casings and aftercuts.

GLOSS

A. **Objective**: Develop a cigarette, for the Japanese market, using specially treated cigarette papers.

B. **Status**: Six cigarette models were made in Semi-works. Three different fillers were used:

- L & M Milds
- "Mount" with experimental total blend casing with "Mount" aftercut
- "Mount" with experimental total blend casing without aftercut, for further flavor work.

Two different cigarette papers were used for construction with each filler.

C. **Plans**: Complete C.I. testing and subjective evaluations for possible Danchi testing.

PROJECT STARSHIP II

A. **Objective**: Produce a 12 mg cigarette for the Japanese market.

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B. **Status**: Four models were fabricated in Semi-works. A "control" was made using L & M Milds filler. The other models used three different fillers and flavor systems designed for use in Project Famous.

C. **Plans**: Complete C.I. and subjective evaluations for possible Danchi testing.

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PROJECT NUMBER: 2307
PROJECT TITLE: Flavor Investigation/Nonvolatile Flavor Investigation/Processed Tobacco
PROJECT LEADER: W. R. Raymond
PERIOD COVERED: June, 1988

I. FLAVOR INVESTIGATION:

A. Objective:
To provide analytical support for activities related to development and application of flavoring materials.

B. Results:

1. Marlboro POL's--Flavor analyses were completed for the second Stockton Street rerun of cigarettes for POL 3584 and 3585. Analytical results are being evaluated and will be compared with those from the previous two runs. Glycyrrhizic acid content of block licorice used for Run #3 was determined for the first time.

2. Project ART--Work continued to characterize compositionally the neutral fraction from a dichloromethane extract of ART filler. Complexity of the fraction has required additional subcutting and workup to remove high boiling constituents and provide simplier mixtures for GC and GCMS analysis. Constituent identifications by GCMS continue.

   A sample of stem from ART pilot run #140 was extracted and analyzed by GC. Qualitatively, stem extract composition appeared to be very similar to that of filler extracts previously examined.

3. Applied Flavor Investigation--Preliminary plug space and rod placement subjective evaluations of yeast-encapsulated peppermint oil and several encapsulated flavors provided by G.F. yielded some interesting results. Analyses are in progress to determine flavor loading levels in these materials. Further subjective and analytical studies are planned.

4. Project Trim--Stability analyses were continued for 8 Trim flavor system prototypes. A production sample of Trim A/C from LVL also was profiled by GC for comparison with a laboratory formulation base profile.

5. Miscellaneous--Forty one natural flavor compounds were analyzed for purity and major impurities were identified where possible. Stability analyses were continued for two flavor compounds being evaluated for Project Extra. Samples of Brazilian and Chinese menthol were compared by GC.

   GC profiles have been generated for 46 essential oils and GCMS spectra of identified components have been incorporated into Flavor Development's MS library.

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II. NONVOLATILE FLAVOR INVESTIGATION:

A. Objective: To investigate tobacco-natural, tobacco-identical and other nonvolatile fractions and constituents for potential application as cigarette flavor additives.

B. Results:

A second round of subjective testing is underway with several Bright tobacco carbon fraction subcuts prepared by S. Tafur to evaluate these materials at higher levels and confirm initial subjective results.

III. PROCESSED TOBACCO:

A. Objective: To develop basic and applied knowledge for the purpose of improvement or selective modification of subjective properties of processed tobaccos.

B. Results:

1. RLB Dry Flavor Replacement--Solid and native roasted St. Johns Bread extracts obtained from a new vendor were analyzed for sugar content and found to be comparable to the most promising prior vendor submission. A second alternate vendor has been identified and samples requested for evaluation. Potential timing and nature of dry flavor replacement production trials have been discussed with Park 500 management.

2. ART Stem--Initial subjective evaluations of small scale cigarettes with post ART stem (25-50% potassium citrate reduction) tended to confirm earlier results. The lowest citrate level (8%) stem replacing ESB-2 in Marlboro was slightly less different from control Marlboro than stem containing either 12% or 15-17% citrate. Further evaluations are in progress with 8% citrate stem replacing ESB-2 and to determine whether 12% citrate stem can be directly utilized for replacement of ES only. Preliminary evaluations of reduced citrate post ART stems in RL's indicated promise for replacement of 1/6 to 1/3 of Bright stem. Current trials with citric acid on stem showed subjective potential at lower levels. Use of citric acid also has proven effective in reducing both AB levels and extraction time (M/M).

3. IS versus ES--A remake of POL 3554 testing 5% ISB-2 in Marlboro was released and shipped. The close-out date is July 25. POL testing of uncased ES from LVL production has been requested.

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PROJECT NUMBER: 4009
PROJECT TITLE: Smoke Studies
PROJECT LEADER: B. L. Goodman
PERIOD COVERED: June, 1988

PROJECT STUDIO

A. **Objective**: Develop subjectively acceptable cigarettes with reduced sidestream visibility.

B. **Results**: Evaluation continued of the effect on cigarette parameters of additives to Kimberly-Clark's small particle size $CaCO_3$ paper. A low level of monoammonium phosphate (MAP) was incorporated in the new submission of papers in addition to 5% succinate and 0.3% carboxymethyl cellulose (CMC).

Sidestream visibility reductions ranged from 40 to 45% compared to Capri. There were no significant differences in mainstream deliveries between the new samples. The papers were also perforated and made into Trim models for internal subjective panel testing. Four models were selected: 1) the 5% succinate only paper, 2) 5% succinate with 0.3% CMC, 3) same as #2 with 0.5% MAP, 4) 5% succinate with 0.3% of a different grade of CMC and 0.5% MAP. All papers had been perforated at 20th Street to 50 Coresta. Tar deliveries for the cigarettes ranged from 6.3 to 7.1 mg, with puff counts of 8.1 to 8.6 puffs. Panel test results are expected the first week in July.

The Studio panel evaluated additional models with two different grades of CMC and found them to be noticeably different in taste. According to S. Baldwin, the two grades have different thermal characteristics, which could result in a slightly altered smoke chemistry. Additional papers with the new CMC but without MAP were requested and received from Kimberly-Clark. Perforated papers will be made into the Trim configuration as soon as a machine is available.

The Studio panel also evaluated slightly more porous versions of the special $CaCO_3$ paper (8 vs. 5 Coresta). They were found comparable to nonperforated versions of paper with the same additive combinations. The trade-off was seen in slightly lower mainstream deliveries and puff counts and a smaller sidestream visibility reduction (32% vs. 43% ave.). Evaluation of the physical characteristics such as ash appearance and streaking are under evaluation. The goal is to find a paper that is subjectively acceptable and the best in terms of hole formation around the charline.

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The level of potassium succinate in the special $CaCO_3$ paper has been analyzed by Analytical Research. Their numbers indicate some variation in levels for the production samples. The target specifications from Kimberly-Clark also have a wide range. The four production run batches of paper showed reasonable agreement between P.M. and K-C, as did some of the earlier special $CaCO_3$ papers coated in their lab from a first mill run. Three of the earlier papers were very different in succinate level from what was described to us by K-C. This could possibly explain some of the discrepancies in visibility that have occurred.

C. **Plans**: Continue investigation of chemical loading on the $CaCO_3$ paper, and development of reduced level $Mg(OH)_2$ wrappers.

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PROJECT NUMBER: 2304, 2305, 4015
PROJECT TITLE: New Product Development
PROJECT LEADER: B. G. Taylor, H. Maxwell, J. B. Easley, and L. S. Wu
PERIOD COVERED: June, 1988

I. MARLBORO/MARLBORO LIGHTS MENTHOL

A. Objective: (1) Develop Marlboro Menthol to appeal more to Salem smokers. (2) Develop a Marlboro Lights Menthol brand extension to appeal to Salem Lights smokers.

B. Status: National retail sales in progress since 2/1/88. Menthol monitoring continues.

Specification changes on Marlboro LTS packings to allow 1X menthol addition to the filter went into production in June.

Marlboro Menthol K.S. cigarette paper was changed from 16 sec. to 12 sec. to adjust the tars to target. Effective the first of June.

POL tests #2148 (Salem Lights vs Marlboro Lights Menthol) and #2149 (Salem Lights vs Marlboro Lights Menthol with 1X menthol in filter) have closed out and results will be available early in July.

Phase II testing of techniques to stabilize menthol deliveries during aging continues. This testing includes "heat" setting of menthol in cellulose acetate and supplemental release of menthol via PVA menthol encapsulations. The results from "heat" setting the filter show an increase in the stability of menthol delivery, however, the initial delivery of menthol is lower. The results from the PVA study are being analyzed. Follow-up Phase III testing is planned for the third quarter.

C. Plans:

Complete replicate POL's 2148-49 and HTI 1719	7/88
Monitor National Prod. Start-up	On-going
Special Studies (complete)	7/88
Phase III Special Studies	3rd Qtr. '88

II. MARLBORO ULTRA LIGHTS

A. Objective: To develop 85/100 mm Ultra Low (6 mg) candidates for Marlboro line extensions.

B. Status: The 85mm and 100mm vs MUL POL tests (#4424 and #7164) are in the field and results are expected by mid-July.

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A revised Half Pint blend has been recommended by the Leaf Department to conform with current operating blends. Models are being made with casings only in Semi-works.

C. **Plans**:

Complete POL testing vs MUL	7/88
Test Market	4th Qtr. '88

III. PROJECT TRIM (Ultra Slim)

A. **Objective**: To develop 17 mm circumference/100 mm Ultra Slim product candidates.

B. **Status**:

TRIM I:

POL testing of Louisville produced Product vs Capri scheduled for both regular and menthol prototypes. Cigarettes for the regular test were shipped and results are expected in mid-July. Menthol cigarettes scheduled to be made in Louisville the week of 7/18/88.

TRIM IV: (Low Sidestream)

Non CMC cigarette paper chosen for Elan and B&H Select ad/pack tests. Both are in the field. Elan has white tipping and B&H Select has cork tipping.

Currently, we are investigating new cigarette papers in order to achieve greater sidestream visibility reduction. Four papers are being evaluated the week of June 27 by an internal PED panel.

Regular and menthol POL cigarettes for TRIM I vs TRIM IV testing will be made in Louisville the week of July 18, 1988.

Lowest acceptable OV and menthol equilibration studies have been initiated.

C. **Plans**:

TRIM POL's vs Capri - Regular Results	7/15/88
Menthol - Make cigarettes in Louisville	mid-July
TRIM I vs TRIM IV POL's (Make cigarettes in Louisville)	mid-July
Test Market Specifications	8/88
Salesman Samples at sales meeting	8/88
Factory Start-Up	8/88
Test market (retail)	10/88

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IV. PROJECT ART

A. **Objective**: To investigate methods to decrease the nicotine content in tobacco. To develop full-flavored, ultra low, and light products using the low nicotine tobacco products.

B. **Status**: Refined prototypes at 6,8,11, and 16 mg tar using the "DL" blend have been made and are under analytical and subjective evaluations.

Internal extended use testing vs Marlboro Lights in progress. Results are expected by mid-July.

Product Development will continue to concentrate on "Merit" and "Marlboro LTS" direction as well as a "free-standing" menthol.

The use of citric acid on stems looks promising. Work is continuing on different casings and AC's for both menthol and nonmenthol ART products.

C. **Plans**:

Product/Flavor Development	On-going
Internal Testing	7/88
Test Market ?	1st Qtr. '89

V. PROJECT NATURAL

A. **Objective**:

Phase I

To develop "All Natural" cigarette candidates with no additives to the tobacco.

B. **Status**: PMI production began 5/17/88 at Stockton Street. Cigarettes were placed on hold because of high levels of spotting. Further primary processing changes are under investigation.

Phase I POL testing of three Natural blends at 8-9mg. tar are in progress. Cigarette samples were made 6/13/88 but were too low in tar. Remaking models week of 6/27/88. POL's will be run the week of 7/11/88.

Recessed POL testing will begin July/August. Flavor models for Phase II were made and awaiting subjective evaluation.

C. **Plans**:

Monitor PMI production start-up	In progress
8-9 mg POL testing	7/88

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Source: https://www.industrydocuments.ucsf.edu/docs/pmfm0000

VI. PROJECT EXTRA

A. **Objective**: The development of 4-8 mg product candidates that have the subjective taste of products with twice the tar.

B. **Status**: CR chemicals continue to be subjectively evaluated. Requested and obtained Phase III clearance on CR 2085. This material is presently being evaluated for optimum use level. Requested and obtained Phase III clearance on CR 2643, which is being evaluated in a number of projects as a sweet flavor enhancer.

C The evaluation of six casings for the all laminal blend in a low density rod configuration was completed. Plans for the use of low density rods and filter design are being discussed. Program will be developed.

C. **Plans**:

Evaluate paper/ca filter variability	3rd Qtr. '88
Evaluate alternate filters	On-going
Complete draft of puff profile status	June/July 1988
Review low density rod program	On-going

VII. Project 202

A. **Objective**: To develop a 2-3mg "Merit-type" cigarette.

B. **Status**: This is a spin-off of the Extra Project.

At this time, three monadic POL tests are schedule for production. These tests are as follows: 1) #0158 - modified Half Pint blend with 25% expanded, Half Pint casings and AC, paper/CA dual filter, and white tipping; 2) #0159 - same as #0158 except it will have cork-on-white tipping; and 3) #0160 - PMSL blend with PMSL casings and AC. These POL tests are all scheduled for shipment in July.

Paper filter components from Intertaba have been received and will be used for the POL tests. Paper filters from Filtrona have been requested and will be evaluated when they arrive.

Also under evaluation are an All Natural blend and a 50% expanded blend.

C. **Plans**:

Ship POL Tests	7/88
Evaluation of Filters and Blends	On-going

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Source: https://www.industrydocuments.ucsf.edu/docs/pmfm0000

VIII. PROJECT VALUE ENTRY

A. **Objective**: To develop products to compete in the Value Entry Categories

B. **Status**:

Alpine

Test market in progress. Ad/pack testing of 85 and 100 mm Full Flavor versions in progress. HTI testing (5079/10145) of Alpine Lights vs Salem Lights were remade the week of 6/6/88 and are awaiting subjective screening. Analyticals were acceptable.

Target

Follow-up (Phase III) POL testing using a special blend and AC was made the week of 6/6/88. This testing is vs Cambridge and includes both full flavor and Lights models. Awaiting analytical and subjective approval.

C. **Plans**:

Complete Phase II Target POL's	8/88
Test Market	4th Qtr. '88

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Source: https://www.industrydocuments.ucsf.edu/docs/pmfm0000

PROJECT NUMBER: 4022
PROJECT TITLE: International Product Development
PROJECT LEADER: L. Mims Evans, R. E. Tinker
PERIOD COVERED: June, 1988
WRITTEN BY: A. H. Confer

I. PROJECT TOLSTOY (VARIOUS COUNTRIES)

A. **Objective**: Develop an upscale Russian-style cigarette.

B. **Results**: Prototypes in 30 mm tube/19 mm filter/35 mm tobacco column configuration with cork, white and cork & white spiral designs were re-fabricated using uncoated tubes. These prototypes were presented at the Greenbrier Conference.

C. **Plans**: At management's request, a milder version will be developed.

II. PROJECT RFM (SINGAPORE)

A. **Objective**: Develop a subjectively acceptable menthol product with a recessed filter.

B. **Results**: Specifications were finalized, and a factory trial was completed.

C. **Plans**: Launch is planned for August, 1988.

III. PROJECT DRAGON (PRC)

A. **Objective**: Develop a "blended" KS cigarette to be a non-PM trademark owned and manufactured by CNTC. Tar targets: 17-19 mg. (GCF-2 factory), and less than 15 mg. (ZCF factory).

B. **Results**: A book is being prepared for presentation to GCF-2 factory management. This book summarized blends, casings/flavors, and cigarette construction proposed for the five prototypes.

C. **Plans**: A return visit to GCF-2 is tentatively planned for the week of July 11.

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II. PROJECT DANNY (MALAYSIA)

A. **Objective**: Increase inclusion of local tobacco in Marlboro while attempting to maintain the taste character of the product.

B. **Results**: Consumer testing of a 50% local inclusion prototype vs. control (35% local) indicated parity.

C. **Plans**: A 40% local inclusion prototype will be consumer tested vs. control.

Source: https://www.industrydocuments.ucsf.edu/docs/pmfm0000

PROJECT NUMBER: 4024
PROJECT TITLE: Japan Product Development
PROJECT LEADER: C. B. Altizer
PERIOD COVERED: June, 1988

I. LARK

A. **Objective**: To maintain the subjective acceptability of the Lark family while retaining the American blended cigarette character.

B. **Results**: The findings from a PMI (ET 1) test evaluating domestically sourced expanded tobacco as a replacement for LET in the Lark blend were received. As with the Danchi test, no difference was seen between the two products by either Lark Milds or Cabin Milds smokers.

A second PMI (ET 2) test which also included the domestically sourced expanded tobacco with an alternate blend showed Cabin Milds smokers felt the test blend was stronger than the existing one. The results were in agreement with the Danchi findings which were reported on in May.

C. **Plans**: A phase in of the domestically sourced expanded tobacco, without other blend adjustments, will begin in July.

II. L&M MILDS

A. **Objective**: Maintain subjective acceptability with the use of a PM USA produced filter.

B. **Results**: The Danchi panel indicated the PM produced filters with charcoal on white tow were not different from those produced in Europe for Philip Morris Lights and L&M Milds.

C. **Plans**: Upon depletion of European produced filters, future production for Philip Morris Lights and L&M Milds filters will be by PM USA.

III. PROJECT GLOSS

A. **Objective**: Develop a subjectively acceptable product which has reduced sidestream visibility.

B. **Results**: A Danchi panel test comparing three low sidestream models against a Philip Morris Super Lights control was completed. Responses indicate low sidestream papers (magnesium hydroxide or calcium carbonate) decrease sweetness and increase irritation. The models using magnesium hydroxide also increased the perceived strength.

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Source: https://www.industrydocuments.ucsf.edu/docs/pmfm0000

C. **Plans**: The strength and irritation comments indicate future models should be designed with tar per puff ratios of one miligram or less.

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Source: https://www.industrydocuments.ucsf.edu/docs/pmfm0000

PROJECT NUMBER: 5001
PROJECT TITLE: Packaging Studies
PROJECT LEADER: H. R. Dunaway
PERIOD COVERED: June, 1988

PACKAGING STUDIES

A. **Objective**: Provide technical packaging support to Manufacturing, Manufacturing Services, Engineering, Purchasing, and Quality Assurance. In addition, assist New Products Directorate in evaluating new packaging concepts and products.

B. **Status/Plans**:

1. **All Natural**: PMI 100 Menthol FTB were conditioned to OV levels in 1% increments down to 6% for subjective evaluation by Flavor Development.

2. **Hercules Co-Extruded Poly**: Two versions of the subject pack film compared favorably to the currently used Mobil Co-Ex in a six week aging study under various environmental conditions.

3. **Project Trim**: Elan 100 FTB Regular cigarettes were conditioned to OV levels in 1% increments down to 6% for subjective evaluation by Flavor Development.

4. **Residual Printing Solvents in Packaging Materials**: Coordinated testing, and advised Purchasing on the acceptability of the following items for use in production:

   - Marl 100 SP-RR/FTB 20/200
   - Reynolds Alcohol Resistant Gold Foil
   - Thiele-Engdahl Water Lacquer DJW5086D
   - .012 SBS Board from International Paper
   - Marl 100 SP 20 Gold - Dennison
   - Elan Pressure Sensitive Pack Sticker
   - 90# C2S Warren Flo Base Sheet for inserts
   - 80# C2S WVA Sterling Base Sheet for inserts
   - Elan Paper/Foil Pack Sticker
   - Elan 60# Hi Gloss Pack Sticker
   - Alpine 25¢ Off Pressure Sensitive Sticker
   - B&H Select Regular and Menthol Pressure Sensitive Stickers
   - Va Slims Shop Carton Insert
   - Famous Value UL 100 20/200
   - Famous Value LTS KS 20/200
   - PMI FF 100 FT 20 AND 20/200
   - PMI LTS 100 FT 20 AND 20/200

5. **Taste, Odor, Stale Customer Complaints**: Marlboro KS SP were conditioned to various OV levels for PED testing on the M/C panel.

6. **Alcan Foil w/Brazilian Tissue**: Cigarettes packaged with this test foil, and a control, were found to be subjectively comparable by the Flavor Development Panel.

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PROJECT NUMBER: 0400
PROJECT TITLE: Low Density Rod Development
PROJECT LEADER: R. S. Mullins
PERIOD COVERED: June, 1988

LOW DENSITY ROD

A. **Objective**: Develop a continuous process for the production of reduced density cigarettes.

B. **Results**: Analysis of data from the CV/OV/Size test indicated that the firmness of the bound rods was determined primarily by the density of the rods and the CV of the filler. The statistical analysis failed to show the size of the filler (%6 mesh) as being a significant factor in determining cigarette firmness. However, since the filler size and CV were highly correlated, this result cannot be considered conclusive.

Production of cigarette samples for puff x puff TPM analysis was completed. Cigarettes were made at normal and 25% reduced density using both normal cigarette paper and a low porosity paper. The low porosity paper was selected such that it will produce in the low density model approximately the same puff count as the normal density/normal paper model. In addition to these cigarette models, 30" long uncut rods in each configuration were also supplied to New Products. These 30" rods will be hand cut into 120 mm lengths and also tested for puff x puff TPM.

At the request of Flavor Development, a test has been designed to compare the effects of applying the aftercut before, during, and after the binder application, on the loss of aftercut components during the coating and cigarette making processes. A memo detailing the proposed test plan has been issued for review and comment. A follow-up to the small-scale casing study has also been planned. Low density samples will be made from filler produced in the large scale primary and coated with three potential casing systems--Marlboro and the two most promising candidates from the small-scale study. Production of the filler by Semiworks is tentatively scheduled for the week of July 18.

The motor for the overhead transfer belt has been received. The transfer belt assembly is currently being assembled and checked out in the machine shop prior to installation on the maker. Installation of the assembly is scheduled for mid-July.

C. **Plans**: Conduct an extended maker run to identify any maker and/or process problems which do not manifest themselves in shorter runs. Install an overhead suction tape to transport the bound rod from the microwave cavity to the wrapping garniture. Produce low density cigarette samples for evaluation of possible casing systems and for testing of aftercut application techniques. Formulate recommendations for any additional work on foamed binder application.

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PROJECT NUMBER: 1307
PROJECT TITLE: Reconstituted Tobacco Development
PROJECT LEADER: R. G. Uhl
PERIOD COVERED: June, 1988

I. IMPROVED SHEET PROPERTIES

A. Objective: Improve the physical characteristics and blend performance of reconstituted sheet materials.

B. Results:

1. ART Project - Pilot RL sheets incorporating ART stems with reduced monopotassium citrate levels (12% and 8% versus 17%) at two ART stem usage levels (replacing 34% and 17% of the feedstock bright stems) were made into blended cigarettes for subjective comparison to direct inclusion models. Preliminary indications are that subjective differences are still detectable, but the test materials become less objectionable as the citrate level decreases.

   The 12% citrate ART stems were also used to replace 10% and 5% of the RL feedstock bright stems. These sheets are being evaluated in 100% cigarettes to determine an ART stem usage level that provides subjective parity with control RL.

   These same 12% citrate ART stems (replacing 34% of the feedstock bright stems) were used to produce solubles crossover sheets. These are being evaluated (100% RL cigarettes) to determine whether the subjective characteristics associated with ART stems follow the soluble (CEL) or the insoluble (baseweb) phase.

   Pilot RL was also produced using ART stems with 7.5% citric acid (replacing 34% and 17% of the feedstock bright stems).

2. Humectants - Casing reformulations for glycerin-free blends are currently under evaluation. A POL remake is scheduled for July.

   PG/glycerin-free Park 500 RL sheets were deemed subjectively acceptable. The corresponding BL Plant RCB is being screened. A small-scale Semiworks evaluation of PG/glycerin-free blends is delayed to August.

   Pilot RL sheets containing individual humectants (PG, glycerin, isosweet, or no humectant) have been started through Semiworks survivability testing to better define the relative merits of humectants vs water in improving shred size.

C. Plans:

1. Complete subjective comparison, in pilot RL, of ART stems containing citric acid vs monopotassium citrate.

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2. Complete subjective screening of ART solubles crossover RL sheets.

3. Continue Semiworks testing of individual humectant sheets.

II. SUBJECTIVE MODIFICATION OF RL

A. **Objective**: Improve or modify the subjective character of RL.

B. **Results**:

1. A liquid flavor sample has been received from Takasago for analysis and evaluation. A sample of their native extract (as extracted and before adjustment of sugars) is pending. This will subsequently be compared to the Chart flavor sample. The best approach to providing a consistent liquid flavor for the sheet plants appears to be purchase of the native extracts from two suppliers, and subsequent blending and final sugar adjustment in-house.

2. Although some peripheral equipment has been received, delivery of the Branson ultrasonic rental unit has been delayed by the vendor. Installation is scheduled in July, and will be coordinated with a necessary pilot plant shutdown for replacement of the sprinkler system main header.

C. **Plans**:

1. Produce pilot RL to evaluate Chart and Takasago liquid flavors as made available from Flavor Development.

2. Complete installation of the Branson ultrasonic rental unit.

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PROJECT NUMBER: 1313
PROJECT TITLE: Semiworks Process Development
PROJECT LEADER: W. G. Sanderson
PERIOD COVERED: June, 1988

A. **Objective**: Provide engineering and technical support to improve the performance and efficiency of the Semiworks operation.

B. **Results**:

Kaymich Flavor Dispensing Unit (Nguyen/Osmalov) - The delivery of the first Kaymich Flavor Dispensing Unit was delayed approximately two weeks with the current expected delivery date now being July 19, 1988. Kaymich personnel will review the installation procedure of this unit and assist in the installation planned for July 20, 1988. The unit will be installed on a MK9/MAXS cigarette making module that is configured to produce Marlboro Lights-type cigarettes.

Second Aftercut Flavor Application System - Semiworks Primary (Nguyen) Job order request numbers were received for the second aftercut flavor application system/mixing cylinder conversion project. Equipment procurement and installation preparations are underway to meet a scheduled completion date of mid-November, 1988. The second aftercut flavor application system will reduce downtime between runs required for cleaning and improve operating flexibility.

Overtipping Improvement Program - Semiworks Make/Pack (Osmalov) - A program was initiated to improve the overtipping process in the Semiworks make/pack. Simply stated, the existing problem is the lack of a consistent fiber tearing bond between the overtipping paper and the cigarette to which it is attached. The overtipping process is used to mask brand names for subjective cigarette comparison testing. A weak bond between the overtipping and the cigarette might allow a panelist to peel back the overtipping, expose the brand name, and possibly bias the evaluation.

C. **Plans**: Continue with the mixing cylinder/second aftercut flavor application system conversion. Transfer the technology developed for the TLA primary process to the Semiworks small scale primary operation. Define optimum operating specifications and/or materials to improve the overtipping process.

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PROJECT NUMBER: 1333
PROJECT TITLE: Semiworks Process Control
PROJECT LEADER: D. A. Phan
PERIOD COVERED: June, 1988

A. **Objective**: Evaluate and revise the process control and data acquisition system to improve processing performance and production quality.

B. **Results**:

Hauni HT Steam Tunnel Installation (Oliver) - A new infeed conveyor is being fabricated by Rayco to replace the troublesome Corra-Trough conveyor. This work is coordinated by F. Boothe of R&D Development Engineering. This conveyor is planned to be installed on 7/22/88. The tunnel is expected to arrive in Richmond the week of 7/18/88. Installation is scheduled to begin on 7/29/88.

3,000-lb. Steam Cylinder Upgrade - (Oliver/Medek/Sims) - Installation of a new steam and water piping rack at the 3,000-lb. preblend steam cylinder was complete and successfully checked out. The system will be back on-line the week of 7/5/88.

Temperature Control System for Scandia Overwrappers (Phan/Sims) - Installation of a temperature control system to control the Scandia end-seal heaters for improving pack seal quality has begun and will be completed the week of 7/5/88.

Computrac Off-Line Moisture Analyzer Evaluation (White) - Evaluation of the Computrac off-line Max 50 deep-well moisture analyzer, located in the Semiworks QA lab, was complete. Results indicated that the analyzer: (1) is compatible with the Computrac currently being used in the small scale process, and (2) has a standard error of estimate of 0.4, with a correlation of coefficient of 0.98 for 45 samples of different tobacco types with moisture levels from 8 to 20%.

C. **Plans**: Complete the checkout of temperature control systems for six Scandia overwrappers and removal of the Quester steam tunnel. Begin electrical and instrumentation design for the second aftercut cylinder. Continue to provide electrical plant engineering support to the Semiworks and conduct routine QA functions.

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PROJECT NUMBER: 1503
PROJECT TITLE: Modified Smoking Materials
PROJECT LEADER: J. G. Nepomuceno
PERIOD COVERED: June, 1988

I. FOAMED FILLER BINDER

A. **Objective**: Develop process for applying a subjectively acceptable binder to the tobacco filler during making to improve cigarette quality.

B. **Results**: The experimental runs at the Semiworks have been completed with the objective of evaluating the full potential of maltodextrins as a binder system. This binder system consisting of 48% maltodextrin and 5% licorice was added to the cigarette at a rate of 0.8% solids and was evaluated in terms of cigarette firmness and loose ends improvements, and subjective acceptability. Data from these tests have been received and evaluated. The data showed no significant improvement in the pack firmnesses of the foam bound rod. Data analysis shows that the firmness improvement resulting from the presence of the binder is negated by the effects of the OV adjustment to the filler. This OV adjustment is necessary in order to compensate for the OV increase that results from the binder addition. In addition, the Flavor Development panels have found these foam bound rod models to be significantly different from the control. Based on these results, it is recommended that this technology be put on the shelf until such time that a more effective means of overcoming the negative contributions of the moisture increase becomes available and a more subjectively acceptable binder is found.

C. **Plans**: Prepare and issue the final report on the findings, conclusions and recommendations for this program.

II. LOW DENSITY ROD (BINDER APPLICATION)

A. **Objective**: Produce pre-coated tobacco via the batch process to support the current product and process development efforts for the low density rod program. Develop a method of pre-applying binders to the tobacco in a manner that can be easily scaled up to commercial scales.

B. **Results**: Process development on the continuous coating reel continued. Successful coating operations were completed with the blanked-off sections under the spray zones removed. This allowed addition of a third nozzle. Operating conditions which allowed the application of 2.5% pectin (total add-on) without build-up on the walls or formation of tobacco/pectin clumps were established for this three-nozzle configuration. However, these conditions resulted in unacceptably low product exit OV's. When the drying rate was reduced to allow production with exit OV's at 13.5%, clumping under the nozzles began which was most likely due to the increased moisture level under each spray nozzle. Additional

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nozzles are currently being added to the configuration in order to address this problem. Development Engineering is currently working on the design of a spray header which would allow us to easily adjust the number and position of the nozzles in the cylinder.

C. **Plans**: Evaluate performance of the coating reel with the additional nozzles in the system to produce filler for evaluation on the low density rod maker.

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PROJECT NUMBER: 1806
PROJECT TITLE: New Tobacco Processes
SECTION LEADER: S. R. Wagoner
PERIOD COVERED: June, 1988

I. PROJECT ART - PILOT PLANT SUPPORT

A. **Objective**: To provide processes for converting and casing stem materials for the Bermuda Hundred Pilot Plant.

B. **Results**: Batches of Louisville cut rolled stems (CRS) were cased with either monopotassium citrate or citric acid and shipped to the Bermuda Hundred Pilot Plant.

The D Pilot Plant CRS line was utilized to produce CRS at 150, 90, and 53 cuts per inch for trials at the BHPP. These trials showed that all three cpi values produced the same pressure drop vs velocity profile for the absorber. This profile was also different from the Louisville CRS, as the Pilot Plant materials produced less pressure drop at a given velocity. The reasons for these results are being investigated.

C. **Plans**: Continue to produce stem products as required by Project ART.

Transfer the Hauni WD tunnel from the Louisville Stem Processing Facility to D Pilot Plant, providing the capability of superheating stems with equipment that has produced IS of acceptable quality in production.

II. PROJECT ART - COMMERCIAL PROCESS DEVELOPMENT

A. **Objective**: To conduct trials providing information for development of the ART commercial process.

B. **Results**: Post-ART filler was processed through the VT separator in MC Core 1 to provide clumps for steam treatment. (This ART run was performed at nonstandard conditions to produce filler containing a high percentage of compacted clumps.) The VT provided a good separation at a maximum feed rate of ~2000 lb/hr. The run yielded 43% heavies (161 lb) containing 87% clumps. The heavy fraction was then processed through the burley spray cylinder in the Semiworks at 500 lb/hr. Residence time was 1.5 minutes, and steam was applied at the entrance and exit. The exit filler contained 20% clumps of reduced size. Moisture analysis of the input and exit materials showed the OV value to increase from 25.5% to 26.4% across the steam cylinder. This VT separator was 24" wide, therefore a larger 36" unit would process ~3000 lb/hr. Thus, if this approach was used for the commercial facility, the designed flow rate (5700 lb/hr) would require two VT separators.

Handmade cigarettes were produced containing post-ART CRS initially cased with 5, 8, and 10% citric acid for subjective

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evaluation. Preliminary screening found these models to be less objectionable than previous cigarettes containing monopotassium citrate cased stems. The results also demonstrated a preference for the middle level of citric acid among those models.

DIET was produced from pre- and post-ART DL filler at the standard expansion temperature of 625F and a reduced temperature of 380F for Product Development evaluations. As expected, there appeared to be little expansion from the runs at the lower temperature. Physical and chemical analyses of the products are underway.

Laboratory work is progressing in the determination of titration curves for blend components and the effects of various factors on the curves. These factors have included the addition/subtraction of nicotine, the addition of ammonia, and the effect of temperature. A computer program was written to predict the effect of water removal on the tobacco pH. In addition, using the titration curves for CRS, predictions were made for the change in pH with the addition of nicotine.

C. Plans: Conduct further testing of steaming parameters required to declump post-ART filler.

Continue subjective evaluations of post-ART stems, initially cased with citric acid.

III. BINDER DEVELOPMENT

A. Objective: Develop methods to produce binder systems for the foam bound rod, bonded ends, and low density rod programs.

B. Results: Several batches of 4% NaCMC/2% licorice were prepared for Engineering's foam bonded ends program. In addition, foam half-life and foam viscosity tests were run on solutions of 4% NaCMC, with licorice content varying from 1 to 2%, to correlate the rate of collapse with the composition of the solution.

A meeting was held with Flavor Development to discuss the application of aftercut within the Low Density Rod Program. Discussions centered around the addition of the aftercut to the 2% pectin solution prior to application on the tobacco. As follow-up to the meeting, surface tension, contact angle, and Haake viscosity data were determined for 2% pectin solutions containing various amounts of aftercut solution. The data showed that there was very little effect on the properties of the pectin solution.

C. Plans: Continue to provide support as required to the above programs.

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IV. TMCI-ASTA SHEET

A. **Objective**: To develop a subjectively and physically acceptable reconstituted tobacco sheet using the TMCI process and PM-RCB technology for international application.

B. **Results**: Initial chemical analysis of Tarragona ASTA samples indicated that products are within specification limits. Selected samples were processed into small scale 7% and 15% blends for subjective evaluation. Large scale Semiworks processing is planned for July to evaluate survivability and for further subjective evaluation.

The need for a finer tobacco grind to improve sheet quality was accepted by TMCI. Trials were run at Williams Grinding Mill Company to determine the capacity of their mill in Cadiz to produce tobacco ground to different sizes less than 60 mesh. A request was made to TMCI to expedite the installation of the Williams mill in Cadiz to provide finer ground tobacco for evaluation in Tarragona prior to Cadiz start-up.

Recommendations were made to TMCI for mechanical modifications to the Tarragona installation which are necessary before any further trials are run.

C. **Plans**:

1. Evaluate ASTA products for survivability and subjectives by the end of August.

2. Run trials to determine the optimum tobacco particle size for ASTA sheet which produces satisfactory survivability through primary processing.

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PROJECT NUMBER: 1810
PROJECT TITLE: Project ART
PROJECT LEADER: Ravi Prasad
PERIOD COVERED: June, 1988

PROJECT ART

A. **Objective**: To support Commercial Plant Design and Flavor Development objectives at the Bermuda Hundred Pilot Plant.

B. **Results**: Further optimization of the absorber column efficiency continued. Citric acid was tested as an alternate nicotine entrapment medium to replace potassium citrate. A CRS absorber column, @ 8% citric acid and 35% OV, was found to give excellent entrapment of nicotine from supercritical CO_2. The citric acid application on stems has shown improved stem subjectives. A decision on conversion to citric acid will be made upon completion of analytical, corrosion, and subjective testing.

Marlboro blend with the ET portion replaced by DBC Bright was nicotine reduced by 95% using standard pilot plant conditions, i.e., 3800 psi, 140°F, 200 M/M. The extracted filler was sent for flavor evaluation.

The on-line nicotine monitor continues to run without any major problems. The monitor was used on two occasions to determine the "completion" of filler extraction. Pilot plant runs #88-166 and 88-167 were stopped at 160 to 170 M/M, based on the nicotine monitor output at a steady nicotine level in CO_2 of 10 ppm. Both runs gave 97% nicotine reduction.

Ongoing support of Engineering was continued via making of filler clumps in special "downflow" runs to simulate the worst case scenario. The clumps produced were supplied for downstream tobacco processing, i.e., the design of hoppers/conveyors/separators.

An all day training session was conducted at the request of the Commercial Plant personnel. Initial feedback indicated that the training session was useful and well received.

C. **Plans**: Continue optimization of absorber bed via optimization of citric acid application level, stem OV and particle size. Support Flavor Development and Commercial Plant design activities.

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Source: https://www.industrydocuments.ucsf.edu/docs/pmfm0000

PROJECT NUMBER: 1101
PROJECT TITLE: Entomological Research
PROJECT LEADER: D. L. Faustini
WRITTEN BY: L. Ryan
PERIOD COVERED: June, 1988

I. PHYSIOLOGICAL STUDIES OF THE CIGARETTE BEETLE (CB)

A. DISINFESTATION OF EXPORT CUT FILLER

1. **Objective**: To obtain ARS/APHIS approval for a phytosanitary certification treatment for export cut filler.

2. **Results**: 100% mortality of ~100,000 CBs was achieved using either Isolcell® conditions at 35°C for 7 days (1) or an Ageless® Z 2000 at 28°C for 6 days (2). Cigarette subjective evaluations showed that for these treatments and vapor phase hydrogen peroxide all cigarettes were found to be acceptable when smoked against controls (3-5).

3. **Plans**: Report results to management and ARS/APHIS (6).

B. GLOBAL ECOLOGY

1. **Objective**: To determine the distribution and ecology of the cigarette beetle as it relates to the processing of tobacco into cigarettes.

2. **Results**: Program initiated for Oriental tobaccos (7,8) and the Kentucky Growers' Association (9).

3. **Plans**: Continue monitoring this season and present a report.

C. WAREHOUSE FUMIGATIONS

1. **Objective**: To investigate the use of Controlled Atmospheres (CA) to disinfest bulk redried tobacco.

2. **Results**: Reported second trials (10) which included an evaluation of cigarette subjectives (11).

3. **Plans**: Undertake extensive final trials during July, 1988 shutdown.

D. SERVICE TO OTHERS

1. **Objective**: To conduct and provide technical services to areas outside R&D.

2. **Results**: An analysis of customer complaints referred to as condensation holes was prepared (12).

   A cigarette beetle control training film, primarily for PM Europe, was begun (13).

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Advice and updates were given on space sprays (14), impregnated films (15) and CB traps (16).

E. VISITS AND OUTSIDE PARTICIPATION

A visit was made by D. L. Faustini to FTR, Neuchâtel, PM Lausanne and the Italian Tobacco Monopoly, May 22 - June 1, 1988 (17,18).

L. Ryan participated in the National Pesticide Symposium, June 8-10, 1988, Richmond, Virginia (19).

F. REFERENCES

1. Drew, S. Notebook No. 7850.

2. Lehman, R. L. Notebook # 8519, pp. 58-64, 79-84, 86-88.

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10. Ryan, L. and Lehman, R. The Application of Carbon Dioxide to Control Cigarette Beetles in Bulk Storage Warehouses - Second Trials. Special Report 88-039.

11. Ryan, L. Memo to D. Faustini. CO_2 Fumigation - Cigarette Subjectives. May 31, 1988.

12. Ryan, L. and W. L. Carter. Customer Complaints ("Condensation Holes") Due to Insects Other Than the Cigarette Beetles. Special Report 88-036.

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13. Ryan, L. Memo to R. W. Cahen and C. Owens. Cigarette Beetle Control - Training Film. June 14, 1988.

14. Faustini, D. L. Memo to Luis Alberto Moro. Deltamethrin (Pyrethroid Space Spray). May 24 1988.

15. Faustini, D. L. Memo to J. L. Charles. Methoprene Impregnated Films - Patent Action Update (RD171). May 4, 1988.

16. Faustini, D. L. Memo to T. Newman. Standard Cigarette Beetle Monitoring Program. May 12, 1988.

17. Faustini, D. L. Memo to Alessandro Trento. Visit to Italian Tobacco Monopoly Mannifattura. May 10, 1988.

18. Freymond, J.-M. Memo to Distribution. Infestation Control Presentation. March 23, 1988.

19. Ryan, L. Memo to D. Faustini. National Pesticide Symposium, June, 1988. April 21, 1988.

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PROJECT NUMBER: 1620
PROJECT TITLE: Electrophysiological Studies
PROJECT LEADER: F. P. Gullotta
WRITTEN BY: C. S. Hayes
PERIOD COVERED: June, 1988

I. NASAL EVENT-RELATED POTENTIALS (NERPs)

A. **Objective**: To develop methods by which to objectively and reliably evaluate human responses to cigarettes, smoke constituents and tobacco flavorants.

B. **Results**:

1. Cognitive NERP Study

Cognitive NERP experiments have been initiated with the goal of utilizing these responses to discriminate differences among flavorants. Employing a cognitive (odd-ball) paradigm, pairs of stimuli (natural menthol vs CO_2 and natural vs synthetic menthol) are being presented to subjects at different probabilities of occurrence (standard = 0.85 vs target = 0.15).[1] Preliminary evidence suggests that subjects are quite good at discriminating between both the menthol and CO_2 and the natural and synthetic menthol. That is, subjects are differentiating the targets from the standards and a late positive component is being recorded in response to the targets that is not found in the standards. Statistical analyses comparing the target and standard NERPs are currently being conducted as a means of quantifying the differences in the responses.

C. **Plans**: Immediate plans are to test ten subjects in the cognitive paradigm comparing natural menthol to CO_2 and synthetic to natural menthol. Further plans include the testing of mixtures of natural and synthetic menthol, d-menthol, (+)-isomenthol and other yet-to-be determined menthol-like compounds.

D. **References**:

1. Hayes, C. S. Notebook No. 8584, pp. 30-40.

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PROJECT NUMBER: 1702
PROJECT TITLE: Optical Processing and Aerosol Research
PROJECT LEADER: K. A. Cox
PERIOD COVERED: June, 1988

I. OPTICAL PACK INSPECTION, THEORETICAL (R. Maher, K. Cox)

A. **Objective**: Develop and test a discriminating filter for use in an optical and/or digital pack inspection system.

B. **Results**: Two filter algorithms and their variations were evaluated using a video library of images of both good packs and packs with the tear tape missing. The missing tear tape is considered a challenging defect to detect as it represents less than 2% of the image. All images were prealigned prior to testing. The following observations were made:

1. The SDF algorithm (developed in house) is capable of error free recognition of packs with missing tear tapes.

2. The algorithms tested work equally well on 8 bit gray scale or binary images.

3. Incorporating unacceptable images in the training set significantly improves the performance of the filter.

C. **Plans**: Test the most promising algorithms on a more extensive image library containing a variety of defects.

II. INDIVIDUAL CIGARETTE INSPECTION (D. Lowitz)

A. **Objective**: Develop methods for the inspection of individual cigarettes on a making machine.

B. **Results**: Improved stabilization was acheived for the simulated sample passing through the CIM 7401 rod monitor head on the CIM test table. A 1/3 mm black dot placed upon the surface of the sample can now be readily detected.

C. **Plans**: Develop the capability for data transfer from the CIM unit to a PC for data analysis.

In collaboration with Professor A. VanderLugt (consultant) and the QA department, establish defect bounds, and calculate primary design parameters for an individual cigarette monitoring system based on an acoustooptic scanner.

III. OPTICAL PACK INSPECTION, EXPERIMENTAL (C. Harward)

A. **Objective**: Evaluate the Global Holonetics SMART CAMERA (SC). Determine its effectiveness in discriminating between good and defective packs.

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B. **Results**: The results of the laboratory evaluation of prototype #2 were summarized in a memo from C. N. Harward. After training on sets of both good and defective packs, the unit correctly identified over 98% of the defecive packs while rejecting less than .5% of the good packs. The types of defects considered included misplaced closure stamp, missing closure stamp, and side-to-side label misalignment. The instrument was less successful in identifying packs having a blemish or a skewed closure stamp.

Evaluation of the SMART CAMERA in a simulated manufacturing environment (carried out in collaboration with Engineering) was temporarily halted due to a lack of stability in the instrument's output. The lack of stability has been attributed to an extreme sensitivity to room temperature. GHC is working on an improved unit which will incorporate an internal cooling system that will maintain the system temperature to within .2°F and permit adjustments to be made to the optics without opening the case. The new unit is expected in early July.

C. **Plans**: Complete the evaluation on a stable unit.

D. **References**: Harward, C. N., "Status of the Evaluation of the Global Holonetics Smart Camera," memo to K. A. Cox, June 10, 1988.

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PROJECT NUMBER: 1704
PROJECT TITLE: Supercritical Fluid Processes
PROJECT LEADER: T. M. Howell
PERIOD COVERED: June, 1988

I. LOW NICOTINE

A. **Objective**: Bermuda Hundred Pilot Plant support.

B. **Results**: CRS stems sprayed with 9.2% citric acid (wt% dry) as an alternative to mono-potassium citrate were used as adsorber in order to qualify the upper end starting point for pilot plant trials. The stem bed was layered, after the extraction, and compared to a similar extraction using k-citrate. The nicotine profile of the citric acid treated stems was much sharper than the k-citrate treated stems, which required 50% more stem bed to adsorb an equivalent amount of nicotine.

C. **Conclusions**: Treating stems with citric acid at the 9% level has been shown to perform better than stems treated with 12% mono-potassium citrate. Decreasing the citric acid loading to 6 - 7% will probably equal the performance of the current treated stems.

D. **Plans**: This work is ongoing.

II. LOW NICOTINE

A. **Objective**: Bermuda Hundred Pilot Plant support.

B. **Results**: A recommendation was made to the pilot plant to alter the post-extraction let-down procedure in order to prevent wax accumulation at the inlet of the filler bed. Initial attempts have resulted in partial reduction of the wax layer, but not significantly. At present, the best alternative appears to be reversing the let-down flow so that the waxes accumulate on the stem bed rather than on the filler bed. This method is planned for a future extraction run.

C. **Plans**: This work is ongoing.

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PROJECT NUMBER: 1708
PROJECT TITLE: Physical Chemistry and Process Monitoring
PROJECT LEADER: J. L. Banyasz
PERIOD COVERED: June, 1988

I. OPERATIONS SUPPORT (J. Crump and A. Closter, in collaboration with the Applied Technology Group)

A. Objective: Determine the effect of particle size distribution on dynamic viscosity changes that occur in PVA tipping adhesives.

B. Results: Simulator testing was completed on a series of adhesives prepared by National using specified resins as base polymers. In each case, the complete adhesive mixture showed greater viscosity changes than its base polymer. However, the rank ordering with respect to viscosity changes was identical for the adhesives and the corresponding base polymers. It appears that the base polymer plays a role but is not the only factor in the observed viscosity changes. In order to determine the variability of these systems, National has been requested to provide replicate batches of a selected adhesive and its base polymer.

C. Plans: Testing of the requested adhesives will be carried out as soon as they arrive.

II. OPERATIONS SUPPORT (T. Van Auken and D. Gilliam, in collaboration with the Applied Technology Group)

A. Objective: Develop a rapid method of pectin determination.

B. Results: A standard curve was obtained based on a model system comprised of extracted tobacco pectin and nonpectinaceous residue mixed in various proportions. Though excellent internal consistency was observed, this system was not found to be representative of materials from the BL plant and has been abandoned. Testing was started with slurries as received from the BL plant.

C. Plans: Testing of slurries received from the BL plant will continue.

III. HUMIDOR PACK (J. Banyasz, T. Van Auken, and D. Spruill)

A. Objective: Develop an RH buffer system for cigarette packs.

B. Results: Testing of the temperature dependence of the RH of the tripotassium citrate-glucose system was completed. The RH was found to vary from 59 to 61% over the temperature range from 10-45°C.

In order to learn how to prepare larger quantities of the solution, three five-gallon batches were made. It was found that keeping the temperature below 65-70°C minimizes yellowing of the mixture.

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PROJECT NUMBER: 1720
PROJECT TITLE: Analytical Microscopy
PROJECT LEADER: V. L. Baliga
PERIOD COVERED: June, 1988

I. LOW SIDESTREAM CIGARETTE PAPERS (Baliga)

A. **Objective**: Develop image analysis procedure to measure visibility of sidestream smoke.

B. **Results**: A glass front chamber was constructed to house cigarettes during static burn. Video tapes were made of the smoke plumes and the luminance measured at two heights above the cigarette (10 mm and 15 mm). The luminance values for Marlboro 85 were significantly greater than the cigarette, G8DR.

C. **Conclusion:** Image analysis can be used as a device to measure sidestream visibility. The conditions for smoking the cigarettes and measurement points in the smoke plume must be optimized and standardized to get reliable data.

II. RESPONSE TO ANALYTICAL REQUESTS (Baliga)

A. **Objective**: Provide analytical support to R&D.

B. **Results**: Material separated from 'Chewbacca' gum was submitted to analytical microscopy to determine what leaf material was used and determine the distribution of leaf particles to granular material in the sample. The leaf material resembled tobacco. The epidermal cell patterns, trichomes, and stomata were similar in structure to the tobacco leaf. The stem material contained spiral xylem elements similar to tobacco stems. The leaf material contained Ca, Si, Cl, and Mg, while the granular material contained Ca and Si. Within the sample, 47% of the sample consisted of leaf fragments and stems and 53% was white granular material (1).

C. **References**

Baliga, V., "Chewbacco Gum - Particle Identification," memo to B. Kanipe, June 8, 1988.

III. MISCELLANEOUS (Sanders)

A. **Results:** K. Sanders attended a one week course on the theory and application of the scanning electron microscope at Lehigh University, Lehigh, PA.

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PROJECT NUMBER: 1730
PROJECT TITLE: Plant, Cell & Tissue Culture Research
PROJECT LEADER: I. L. Uydess
WRITTEN BY: S. Tenhet
PERIOD COVERED: June, 1988

I. TOBACCO-IDENTICAL PRESERVATIVES

A. **Objective**: To develop procedures and to establish microbiological screens for the evaluation of new, nature-identical preservatives as replacements for and/or as adjuncts to propylparaben.

B. **Status**:

1. **Phase I Preservative Screens**

The screening of a set of C-5 through C-14 Fatty Acids has been completed. Maximum antimicrobial activity was observed at 100 µg/ml for C-10 thru C-12 containing acids. Combinations of Decanoic Acid (C-10) and Propylparaben (in PG) were also evaluated at ratios of 3:1, 1:1, and 1:3 (Propylparaben : Decanoic Acid) to yield a final (total) concentration of 100 µg/ml. All combinations were found to be inhibitory to the growth of the target bacterium PM #13 (tentatively identified as B. coagulans) for up to 24 hours. This was a significant finding since the 3:1 → 3:1 ratio was not initially expected to be inhibitory to the microorganism used.

2. **Microbiological Investigations**

The development of a Phase II standard operating procedure continued during this month using a bacterium obtained from spoiling SEL. Growth curves were evaluated of fresh and refrigerated cultures of this gram positive isolate (#54) to establish the reliability and reproducibility of the procedures used.

C. **Conclusions**: None to be reported at this time.

D. **Plans**: (July 1988)

1. To conduct Phase I screens using various mixtures of C-9 through C-12 Fatty Acids.

2. To evaluate the antimicrobial activity of the Fatty Acids in SEL.

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PROJECT NUMBER: 1752
PROJECT TITLE: Optical Spectroscopy of Tobacco and Smoke
PROJECT LEADER: J. O. Lephardt
PERIOD COVERED: June, 1988

I. TANDEM MASS SPECTROMETRY

A. **Objective**: Acquisition of a tandem mass spectrometer system.

B. **Results**: Major activities with respect to acquisition of the tandem mass spectrometer system have included completion of site evaluation, acquisition of cost estimates for room renovation of sites, evaluation of direct purchase of GC and HPLC equipment and development of a detailed document describing projected uses of the tandem system.

C. **Conclusions**:

The optimum site for location of the new instrument would be in the basement. Low vibration levels and significant advantages in physically getting the equipment from the loading dock to the lab are principal advantages. The space available in the old computer room is marginal at best and B-102 (the current computer room) would therefore be the most appropriate location for this instrument.

At the recomendation of the selected vendor (JEOL), we have explored the option of direct purchase of GC and HPLC accessories by PM. Since JEOL has no special contracts with vendors of this equipment, the advantages of buying direct are somewhat reduced cost, direct warranties and in the case of HPLC equipment specific training by the vendor.

Documentation of projected uses of the instrument has been prepared. This is in the form of a memo to Richard Cox from Nancy Jensen (6/27/88).

Additionally it should be noted that Jensen, Hsu and Magin attended the American Society for Mass Spectrometry meeting in San Francisco. Pertinent details of this meeting are discussed in a joint memo that is being prepared.

D. **Plans**: Documentation relative to submission of a purchase request for the tandem mass spectrometer system has been completed and will be submitted for management approval.

II. ASHTRAY ODOR

A. **Objective**: Identification of ashtray odor.

B. **Results**: Factor analysis of the odor data collected last month for the four neutral subfractions indicated that subfractions 1 and 3 were rated highly with smoky, burn and stale notes, typical

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of the ashtray odor. Of the compounds identified in conjunction with odor sniffing of GC effluents, information from the odor database indicated that none, including the carbonyls, were responsible for the odor. Some minor components with low odor threshholds appeared to be important contributors to the odor. In order to study these minor components, it was necessary to increase the sample concentration so that mass spectra of good quality can be obtained. Neutral fraction was isolated from the vacuum distillates of 800 butts from Marlboro 85 mm cigarettes. Fractionation of the neutrals was accomplished by preparative GC and fraction collection on a polar and a nonpolar columns. Because of the enhanced resolution as compared to the silica gel column used earlier for fractionation, it provided fractions with no overlap. Thus the odor associated with each fraction was more unique and representative. Four fractions were collected from a ov-1 column and submitted for evaluation by the Odor Panel.

C. **Plans**:

1. To reduce the complexity of the important fractions by narrowing the time window of collection without affecting significantly the odor.

2. To identify the odor contributing compounds by GC/MS.

D. **References**:

PM Notebook 8586, pp. 51 - 61.

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PROJECT NUMBER: 1754
PROJECT TITLE: Spectroscopic Studies of Tobacco and Smoke Components
PROJECT LEADER: J. B. Wooten
PERIOD COVERED: June, 1988

SOLID STATE NMR OF TOBACCO COMPONENTS

A. **Objective**: Determine the composition and structure of tobacco cell wall biopolymers (J. Wooten).

B. **Results**: Stem tissue L. leucocephala that was fed β-^{13}C ferulic acid for extended periods during its growth was examined by ^{13}C CP/MAS NMR for ^{13}C labelled carbons in the cell wall lignin. The ^{13}C incorporation was insufficient to unambiguously draw conclusions about the lignin bonding patterns, in part because of negative signals in the difference spectrum between ^{13}C and ^{12}C labelled plant tissue. The negative signals are an indication that the plant metabolism in the two sets of plants was not identical. This difficulty must be resolved before low levels of ^{13}C labels can be detected.

A. **Objective**: Determine the composition of the base gum in "Chewbacco".

B. **Results**: The outside coating of "Chewbacco" was removed and the interior base gum was examined intact by ^{13}C CP/MAS NMR and single pulse MAS NMR. Cross polarization (CP) is effective for detecting rigid (hard) components while the single pulse method detects components that are very much more mobile (soft). The two types of spectra were very different, indicating a mixture of soft and hard components in the gum. The signals have been only partially assigned. The soft component contains signals that match polyvinyl acetate and a signal that corresponds to polymethylene chains, possibly polyisobutylene rubber. Weak aromatic signals appear which may be nicotine in the the soft gum portions. Several signals corresponding to hydroxyl bearing carbons appear in both the hard and soft components. These signals may result partially from sorbitol, which has been identified in the water soluble portion of "Chewbacco", but appear to be primarily an unidentified polysaccharide polymer. A signal from polymethylene chains also appears in the hard component spectrum.

C. **Plans**: Solution NMR spectra will be obtained and compared with the solid state results. The spectra will be interpreted on the basis of the previously reported compositions of chewing gum base.

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PROJECT NUMBER: 1757
PROJECT TITLE: Analytical Flavor Specifications
PROJECT LEADER: C. S. Kroustalis
PERIOD COVERED: June, 1988

ANALYTICAL FLAVOR SPECIFICATIONS

A. **Objective**: Develop analytical and subjective specifications for incoming flavors and materials for use at the Flavor Center and other QA facilities.

B. **Results**:

Ninety-five finished specifications were submitted to Mr. F. Daylor for recoding to DM codes. Eleven methods used with these specifications were also submitted to Mr. Daylor. After recoding is completed, the specifications will be transmitted to Mr. E. Cook's group for implementation by QA. Specifications for approximately eighteen additional materials will be issued as soon as the draft specifications are reviewed.

We are currently evaluating fifteen new materials from a single vendor. These evaluations will complete all of the materials purchased from this vendor.

C. **Plans**: Complete evaluations of materials on hand and begin evaluating new materials as soon as they are available. Issue final specifications of all materials we have completed.

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PROJECT NUMBER: 1758
PROJECT TITLE: Tobacco Cell Wall Research
PROJECT LEADER: G. H. Bokelman
PERIOD COVERED: June, 1988

I. ESTIMATION OF BLEND COMPOSITION FOR TWO NEW CIGARETTE BRANDS

(G. Bokelman, J. Stimler and General Analytical)

A. Objective: As requested, predict the blend compositions of two new cigarette brands, American Spirit and Midwest.

B. Results: The Sante Fe Tobacco Company has introduced American Spirit 85 Filtered and Nonfiltered cigarettes throughout the United States. These cigarettes are advertised as "100% additive-free Virginia tobaccos and nothing else." Based on our blend composition analysis (1), if the stem content represents bright stems, then the American Spirit cigarettes actually may contain 90% or more flue-cured tobaccos--but they do not contain 100% flue-cured tobaccos. We suspect that there may be a certain lack of process control, since these cigarettes are made for the Santa Fe Tobacco Company by another company (G. A. Georgopulo & Co., Inc., a specialty cigarette manufacturer in New York). The presence of small amounts of burley lamina and Oriental leaf might represent scrap contaminants, whether intentional or unintentional, from other cigarette runs.

Concern has been expressed regarding a new cigarette brand in a flip top box, Midwest, which may infringe upon both our package design and advertising copy for Marlboro (2). So far this brand has been offered for sale in Lebanon and has appeared at international trade shows in Holland, Sweden and Singapore. It is believed that this product may be produced in Greece. Except for a reduced content of Oriental leaf, the predicted blend composition of Midwest cigarettes was found to be similar to that of Greek Marlboro (2). It is interesting to note, based on a microscopic examination by Nancy Ryan, that the filler for Midwest cigarettes contained pieces of stem attached to the lamina, unlike other fillers. It may be that some form of whole-leaf cutting is utilized in the production of Midwest filler.

C. Plans: In the near future we will compare the chemical compositions of selected U.S. and Chinese tobaccos.

D. References:

1. Bokelman, G. H. and J. O. Stimler, memo to J. E. Wickham, "Blend Composition of American Spirit, a Newly Introduced Brand," June 22, 1988.

2. Bokelman, G. H. and J. O. Stimler, memo to J. L. Charles, "Blend Composition of Midwest (Flip Top Box)," June 14, 1988.

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II. SIDESTREAM REDUCTION (S. Baldwin, S. Tafur, G. Bokelman & B. Rogers)

A. **Objective**: Develop research strategies in the area of sidestream reduction to be accomplished in the next 3 to 6 months.

B. **Plans and Results**: Plans have been made to accomplish the following goals: (1) develop the capacity to produce both paper hand-sheets and bobbins of cigarette paper, (2) examine high surface area cigarette paper fillers for the condensation of sidestream smoke, (3) develop a protocol for the evaluation of sidestream reduction, (4) develop thin film coatings to decrease the porosity of cigarette paper, (5) examine the use of thermoplastic additives or coatings to diminish the emission of sidestream smoke occurring at the char line, (6) examine core vs. periphery effects of cigarette fillers to reduce the generation of sidestream smoke, and (7) modify the fiber used in order to decrease the porosity of the cigarette paper or otherwise reduce the emission of sidestream smoke.

To date numerous samples of fine particle size fillers and a variety of paper-coating polymers have been ordered, many of which already have been received. Also, to enhance our capabilities in this area, Sue Tafur attended a course on "Introduction to Pulp and Paper Technology."

Cigarettes have been prepared from a standard 25 g/m^2 basis weight paper which had been coated with approximately 0.5% and 1.0% carboxymethyl cellulose (CMC) 7LF, using size press coating. As expected, the porosity of the coated papers decreased. The static burn time increased in the CMC-treated cigarettes, but most other parameters were unchanged. No sidestream smoke measurements have yet been made.

C. **Reference**:

1. Bokelman, G. H. and R. S. Slagle, memo to R. N. Ferguson, "Proposed Research on Cigarette Papers and Filler Modifications for Sidestream Reduction," June 16, 1988.

III. BRIGHT NON-VOLATILE FRACTIONS (S. Tafur and M. Core)

A. **Objectives**: Develop and apply methods for further separation of non-volatile tobacco fractions obtained from Flavor Development personnel.

B. **Results**: The vacuum liquid chromatography procedures using C_{18}-silica and NH_2-silica were scaled-up to allow larger quantities of Fr IV to be processed to a subfraction highly enriched in selected glycosides. Preliminary subjective evaluations by Flavor Development of selected Bright fractions were conducted at levels of 0.5 mg add-on per cigarette. New samples also were supplied to allow evaluations at higher addition levels.

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C. **Plans**: The status of this research effort will be reassessed following completion of subjective evaluation of recently submitted samples.

IV. CHARACTERIZATION OF TOBACCO HEMICELLULOSE (S. Baldwin)

A. **Objective**: Characterize hemicellulose isolated from green Coker 319 tobacco.

B. **Results**: As part of a collaborative contract research project, Dr. Norman Lewis at VPI&SU sent us a crude sample of hemicellulose that had been extracted from green Coker 319 tobacco grown in the greenhouse at Philip Morris. Water "soluble" and insoluble fractions were obtained by centrifuging a suspension/solution of the starting material at 2000 rpm for 20 minutes to achieve a crude separation of the grossly insoluble material from the more soluble material. Neutral sugar analysis was carried out on both fractions, which had distinctly different compositions.

Recently an additional three samples of tobacco hemicellulose were received from Norman Lewis. Neutral sugar analysis revealed slight differences among the compositions of these three samples.

C. **Plans**: The individual components within the various samples of tobacco hemicellulose will be isolated and more completely characterized.

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PROJECT NUMBER: 1902
PROJECT TITLE: Tobacco Microbiology
PROJECT LEADER: D. J. Ayers
WRITTEN BY: D. K. Chadick
PERIOD COVERED: June, 1988

I. MICROBIAL ANALYSES OF MOLD

A. **Objective**: To determine a more rapid method for the enumeration of mold.

B. **Results**: Several studies were conducted which compared the mold counts obtained from Czapek Dox agar vs. HC agar, an agar used in the cosmetic industry for the analysis of mold. According to the literature, the HC agar required only 3 days incubation vs. the current 7 day incubation period using Czapex Dox agar (1). However, the data showed that the mold counts from HC agar after incubation for 3 and 7 days were lower than the mold numbers observed from the Czapek Dox agar after 7 days of incubation (1).

C. **Conclusions**: Continue to analyze for mold using the laboratory SOP (2).

D. **Plans**: Report results in a memo.

E. **References**:

1. Gaines, O. Notebook No. 8505, p. 181-186.

2. Crockett, E. A. Standard Operating Procedure for the Enumeration of Bacteria and Fungi from Tobacco and Tobacco Sheet. PM Special Report, Accession No. 86-055; 1986 February 20.

II. SHREDDED STEM STUDY (STORAGE OF POST-ART DRIED SAMPLES)

A. **Objective**: To determine the effect of long term storage on microbial counts in the post-ART dried samples (12% OV).

B. **Results**: A decrease in bacterial counts was observed after 12 weeks of storage in the post-ART dried samples from studies 1,2,3, and 5 compared to the initial numbers. The 12 week bacterial counts from study 4 showed a slight but insignificant increase (1.2 fold) when compared to the initial counts (1). The 12 week mold and yeast counts were within the acceptable range (1).

C. **Conclusions**: The study is complete.

D. **Plans**: A memo will be issued detailing the results.

E. **References**:

1. Gaines, O. Notebook No. 8505, p. 160, 162, 166, 170-173.

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III. RCB ALTERNATE HUMECTANT PROGRAM (BL PLANT RUN)

A. **Objective**: To determine if RCB (control and test sheets), produced as part of the Alternate Humectant Program, differ in microbial numbers.

B. **Results**: After 4 and 8 weeks of storage the RCB control and test sheets exhibited a decrease in mold and bacterial counts compared to the time zero values (1).

C. **Plans**: This is an ongoing study.

D. **References**:

1. Jones, J. Notebook No. 8590, p. 34-35, 40.

IV. BACTERIAL IDENTIFICATION

A. **Objective**: To identify bacterial isolates from different sources.

B. **Results**: The SOP for bacterial identification (1), using the Vitek along with supplemental biochemical tests, has been used to identify eight bacterial isolates from laboratory spoiled SEL. Based on the identification the SEL isolates have been characterized into three groups; six of the cultures were Bacillus coagulans, one isolate was B. sphaericus, and one was B. stearothermophilus. The group of B. coagulans was further separated into three separate strains (2).

C. **Conclusions**: The study is complete.

D. **Plans**: A memo will be issued detailing the previously mentioned results.

E. **References**:

1. Chadick, D. Standard Operating Procedure for the Identification of Bacteria with special emphasis on the genus Bacillus, in preparation.

2. Chadick, D., PM Notebook 8625, p. 39-38, 59, 61-62.

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PROJECT NUMBER: 1904
PROJECT TITLE: Tobacco Physiology and Biochemistry
PROJECT LEADER: H. Y. Nakatani
WRITTEN BY; H. Y. Nakatani and E. D. Mooz
PERIOD COVERED: June, 1988

I. LOW NICOTINE STUDY

A. **Objective**: To investigate the biochemistry of the nicotine biosynthetic pathway at putrescine N-methyltransferase (PMT) and specifically to isolate PMT from tobacco root extracts.

B. **Status**: Harvesting of the group 12 tobacco plants (35 plants, with an average root weight of 450 g) was completed, and the processing to the 40-65% ammonium sulfate stage of the root extracts from group 11 was done.

A number of column sequences were examined to determine changes in specific activity and yields (2,3,4,6). With the phenyl-Sepharose, DEAE-Sepharose and Sephacryl columns, a 20 to 30-fold increase in specific activity from the ammonium sulfate stage was observed for the series; losses in PMT activity during the purification may be responsible for the low fold increases.

To reduce some of the pressure problems associated with the presence of glycerol and the routine operation of the columns, a PMT sample was applied to the phenyl-Sepharose column in the absence of glycerol. Surprisingly, PMT activity was eluted throughout the 1.5 M to 0 M NaCl gradient in the absence of glycerol rather than towards the end of the gradient as was observed when glycerol was present. An increase in specific activity of 9.9 for this step alone over the ammonium sulfate stage was seen; however, the large volume (1 L gradient) of the sample obtained by this method warrants further examination. A large, non-PMT, 280 nm absorption peak normally observed with the phenyl-Sepharose column in the presence of glycerol was still present in this glycerol-free column. This indicated that the absence of glycerol allowed the separation of PMT from this non-PMT, 280 nm absorbing specie(s). Maximization of this anomalous behavior to enhance the purification is being addressed.

Because of the above observations, a purification scheme was attempted with the complete absence of glycerol at all stages. PMT-activity decreased dramatically unless tha samples were concentrated against sucrose during the interim steps, i.e., stabilized by an osmoticum.

Studies addressing the stability of PMT have been implemented because of the rapid decline in PMT-activity in the absence of glycerol. Glycerol was added back to a PMT sample which had been subjected to Sephadex G-25 chromatography to remove glycerol and salts. The following glycerol concentrations were examined 20, 10, 5, 1 and 0% (v/v) over a total of five days. Twenty per cent glycerol stabilized the PMT activity of these samples up to 48 hr

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at 4°C. At 48 hr, the PMT activities for the other samples (1, 5, and 10% glycerol) were less than 50% of the 0 time samples. The PMT activity for the 20% glycerol sample was reduced to about 50% of the 0 time sample in five days, whereas the PMT activities were less than 20% of the 0 time samples by the fifth day for the other glycerol concentrations tested. Different salt concentrations were also examined to determine the efficacy of salt stabilization (0. 0.05, 0.10, 0.25 and 0.50 M KCl). After 24 hr, all samples showed PMT activities approximately ≤ to 50% of the 0 time samples. Both of these studies showed that of the conditions examined, PMT-containing fractions were stable only in 20% glycerol.

To characterize further the enzyme that is being isolated as PMT, substrate specificity studies were implemented. The substrates chosen were the structurally similar diamino-analogs of putrescine (diaminobutane), diaminopropane and diaminopentane. The PMT activities of the analogs compared to the controls with putrescine averaged 2.6% for diaminopropane and 1.1% for diaminopentane. The starting material for these studies came from two different PMT-containing preparations obtained through DEAE-Sepharose and phenyl-Sepharose columns. These results lend support to the notion that the enzyme that is being isolated is indeed PMT.

PMT was also subjected to SDS-PAGE in the presence and absence of 2-mercaptoethanol to examine the monomeric nature of PMT. Under these conditions, only minor changes in the polypeptide banding pattern were observed in regions other than the 55-65 kDalton region indicating the monomeric nature of PMT (3).

A preparative isoelectric focusing (IEF) device was also examined (Rotofor, BioRad) for possible use in the purification of PMT. Peak PMT activity was obtained in a fraction focusing around pH 5.1. The SDS-PAGE profile indicated possible aggregation which may require the use of detergents for dissolution (3). To examine the possibility that Triton X-100® could be used for this purpose, PMT active samples were incubated with the IEF solution and Triton X-100®. The PMT activities were found to decrease approximately 30% to 40% (0.1 and 1% Triton X-100®, respectively) from the control over a time period similar to that used during the isoelectric focusing. This suggests that Triton® may be useful during the isoelectric focusing step.

Immunochemical studies were continued with the MagniSort beads (DuPont) (5). Some decrease in PMT-activity was observed for four antibody samples obtained from Hazleton even after considering that seen with the controls (5).

C. **Plans**: Extracts from the group 12 harvest will be processed to the 40-65% ammonium sulfate stage. Modification of the conditions to elute PMT from phenyl-Sepharose in the absence of glycerol will be continued. Examination of larger sample sizes and alternate pooling practices for the Sephacryl column will be examined with the aim to increase the specific activity towards 1000 from the

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ammonium sulfate stage. Further stability studies using polyethylene glycol and ethylene glycol will be examined. These may assist in the elution of PMT from the hydrophobic interaction column (phenyl-Sepharose) and stabilize PMT for further column examination (e.g., Sepharose gel filtration column). Other substrates for PMT will be tested and Km data will be obtained for putrescine and SAM.

D. **References**:

1. Dunn, R. L. Notebook No. 7899.
2. Malik, V. Notebook No. 8542.
3. Sykes, A. Notebook No. 8526.
4. Yu, T. Notebook No. 8381.
5. Mooz, E. D. Notebook No. 8599.
6. Crockett, E. Notebook No. 8563.

II. ALTERNATE HUMECTANTS (PG/G-FREE SHEETS/CIGARETTES) (1)

A. **Objective**: To produce an acceptable cigarette (domestic Marlboro-type) which is PG/G-free by the end of the third quarter of 1988.

B. **Results**: 100% test cigarettes made from production plant PG/G-free RLTC and RL150B sheets were the preferred choice when compared to 100% control RL cigarettes (2). Subjective data from 100% test cigarettes made from production plant PG/G-free RCB and control RCB are being reevaluated (2). Samples of PG/G-free, RL cigarettes submitted for toxicological evalution were found to be similar to the controls (3). PG/G-free RCB and control cigarettes were retested and found to give similar toxicological results (3).

C. **Plans**: Zero time survivability tests on the production plant PG/G-free, RL and RCB sheets will be made. Small-scale, blended PG/G-free cigarettes and control cigarettes will be made in the Semi-works for subjective and toxicological evaluations.

D. **References**:

1. Mooz, E. D. Notebook No. 8599.
2. Ruziak, S. Personal communication. 1988 June 17.
3. Thompson, L. Personal communication. 1988 June 24.

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III. ALTERNATE HUMECTANTS (GLYCERINE-FREE SHEET/CIGARETTES) (1)

A. **Objective**: To produce an acceptable glycerine-free (G-free) cigarette (domestic Marlboro-type) for a POL test by the end of the third quarter of 1988.

B. **Results**: Data are being obtained from the zero time survivability test run in the Semi-works on G-free RCB sheets made at the BL Plant in 2/88. Information from the three-month, G-free, Park 500 RL sheet survivability test have been received and are being evaluated.

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Control and G-free POL cigarettes made in April were rejected due to three factors: 1) a possible problem with the tar delivery data on the control cigarette (2); 2) low total PG and G levels in the control (2); and 3) the unacceptable subjectives from the Richmond Panel regarding both the test and control cigarettes (3).

C. **Plans**: A G-free, POL remake of Marlboro and control cigarettes is scheduled in the Semi-works for the week of July 11.

D. **References:**

1. Mooz, E. D. Notebook No. 8599.
2. Ruziak, S. Personal communication. 1988 April 22.
3. Spielberg, H. Personal communication. 1988 April 29.

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PROJECT NUMBER: 2106
PROJECT TITLE: Cigarette Performance and Design
PROJECT LEADER: R. W. Dwyer
PERIOD COVERED: June, 1988

I. LOW-DENSITY ROD DELIVERIES (B. Dwyer)

A. **Objective**: Determine the effects of tobacco-rod densities on tar deliveries.

B. **Results**: A computer model has been developed which predicts the tar deliveries of cigarettes as functions of tobacco-rod density, wrapper permeability, filter pressure drop, and filter ventilation level. One goal of this study is to determine if a delivery/dilution advantage might exist with low-density tobacco rods. This was investigated by constraining the total pressure drops and tar deliveries of low-density rods to match those of current brands. Since the pressure drops across low-density rods are lower than conventional rods, it was thought that the filter pressure drop could be increased thereby increasing filter efficiency and allowing lower ventilation levels to achieve the same total tar delivery.

C. **Conclusion:** Low-density tobacco rods have lower pressure drops and higher tar deliveries than conventional rods. Because the deliveries are higher, they require higher pressure-drop filters to keep the tar at the same level as in the controls. Therefore, there does not appear to be any significant dilution advantage in these products. For example, we calculate that 54% ventilation is required in a MUL with a rod density of 0.18 g/cc in order to match the tar delivery of a conventional MUL at the same total-cigarette pressure drop. This compares with a filter ventilation of 54% observed in the current MUL from the 3/88 CI Report.

II. TOBACCO-ROD PRESSURE DROPS (M. White)

A. **Objective:** Determine the effects of cigarette design on tobacco-rod pressure drops.

B. **Results:** The analysis of data from an experimental study has been completed. The design characteristics investigated included tobacco-rod density, shred cut width, rod length and circumference, and filter ventilation level. We now have the capability of calculating the rod pressure drops as functions of these design parameters.

C. **Conclusions:** The pressure drop across a tobacco rod is a second-order function of ventilation, linear with length, inversely proportional to circumference squared, and a fourth-order function of rod density.

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PROJECT NUMBER: 2500
PROJECT TITLE: Fundamental Chemistry
PROJECT LEADER: J. I. Seeman
PERIOD COVERED: June, 1988

I. FLAVOR/ODOR CHEMISTRY (Paine, Seeman)

A. Objective: To develop new technologies for smoke deliveries of desired flavorants; to prepare new substances for flavor/odor evaluation; to develop methodologies for the analysis of subjective data; to derive relationships between physicochemical parameters and subjectives.

B. Results and Plans: Large scale preparations of d-isomenthone, d-menthol, and l-menthone were completed and 10 g samples of each were transfered to Flavor Development. Large scale (1.5 mole each) preparations of both tri-d-menthyl borate and tri-l-menthyl borate are in progress. D-Isomenthol was purified by crystallization and supplied to F. Gullotta. Additional work in this area continues as well.

Discussions continue with Professor R. Anholt (Duke University) regarding a collaborative trigeminal research program. Preparation of a manuscript comparing odor profiling and rank scaling on green/bell pepper odorants is in progress.

II. MISCELLANEOUS (Paine, Secor, Seeman)

Results:

A. Succinylated 4'-(2-hydroxyethyl)nicotine was prepared and analytical data is being obtained. This compound, upon final purification, will be given to B. Davies for use in various biochemical studies.

B. Efforts have begun to prepare a nicotine release agent to examine (by S. Haut) the smoke chemistry of nicotine as it may be related to unextractable nicotine.

C. We are in the final experimental and writing stages for a draft of a patent on aminonicotinoids.

D. Literature work and evaluations have been undertaken to develop novel inorganic adducts to cigarette paper for sidestream control.

E. Discussions continue with Sepracor, and we continue to support their work on the use of novel membrane technology in the separation of nicotine from aqueous liquors.

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PROJECT NUMBER: 2501
PROJECT TITLE: Smoke chemistry
PROJECT LEADER: R. Comes
PERIOD COVERED: June 1988
WRITTEN BY: S. Hassam

I. SIDESTREAM SMOKE

A. Objective: Collect and analyze sidestream smoke from different cigarette models by GC/MS. Investigate detection of known odorants in sidestream smoke by GC. Develop standard parameters for sidestream smoke collection and analysis. Design and apply instrumentation for sidestream visibility measurements. Collect and analyze gas phase smoke from radiolabeled cigarettes.

B. Status: (1) A Tekmar desorber installed on a Vista 6000 GC for SS gas phase analysis is functional but problems with failed solenoids persist. (2) Limitations of GC as a method to detect odorants in smoke have been investigated. (3) Collection of SS and MS smoke data for the CORESTA sidestream cooperative study to establish standard parameters is in progress. (4) The 17-port smoker for SS visibility measurements is fully operational and operator training has been completed. Work is in progress to set up a 5-port smoker for SS visibility studies. (5) Method development to use gas radiochromatography to analyze smoke from radiolabeled cigarettes is in progress.

C. Results: (1) Solenoid problems associated with the Tekmar desorber are being investigated, with assistance from Tekmar service personnel. Despite these problems, a protocol has been developed to collect and analyze SS gas phase using a Tenax trap/desorber/GC system, with parallel FID, NPD and MSD. More than 150 compounds have been identified in gas phase smoke from 2R1 cigarettes using this approach. (2) A memo has been written summarizing results of smoke investigations with odorous valerate compounds using GC as a method of detection. (3) Collection of SS smoke from Spanish and FCV cigarettes for the CORESTA study were continued. Kentucky reference 1R4F, Marlboro, Capri, and Elan cigarettes were smoked to collect TPM for comparison to visibility measurements. (4) The 17-port smoker is being used for SS visibility measurements of various cigarettes. Parts for an optical system that will approximate sunlight have been ordered for use with a 5-port smoker that is currently being reassembled. (5) The minimum amount of radioactivity detectable using the GC radioactivity detector is 0.5 nCi. Work continues to establish the counting efficiency of the detector. Mainstream gas phase from a ^{14}C-glycerol cigarette has been analyzed and preliminary results show radiolabeled carbon monoxide, carbon dioxide, methane, ethane and ethylene to be present.

D. Plans: (1) Continue method development of gas phase analysis. Apply method to different cigarette models. (2) Build a sniffing port for use in the application of GC detection of odorant compounds in smoke. (3) Continue collection and analysis of data for CORESTA study and comparison to visibility measurements. (4) Continue development of

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instrumentation for SS visibility studies (5) Continue testing and method development of GC radioactivity detector for routine use.

II. SIDESTREAM SMOKE CHAMBER

A. Objective: Design and construct an environmentally controlled chamber to measure selected components of sidestream smoke.

B. Status: (1) Laboratory modifications to facilitate construction of the chamber are in progress. (2) Cost data of laboratory reconstruction, chamber construction and installation, and of proposed instrumentation has been acquired.

C. Results: A justification job order and appropriation request have been submitted.

III. MISCELLANEOUS

(1) Pyrolysis/GC/MS analyses have been carried out on various samples as requested. (2) The neutron camera, used in neutron radiography, was rewired for use with the new Gould image processor. An intensive training course on the use of the image processor was attended at UVa.

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PROJECT NUMBER: 2520
PROJECT TITLE: Flavor Research
PROJECT LEADER: E. W. Southwick
PERIOD COVERED: June, 1988

I. GLUCOSE-DERIVED FLAVORANTS

A. **Objective**: To develop glucose-derived flavorants.

B. **Results**: A mixture data-sheet (M-1009) has been completed describing a tetramethylpyrazine-beta-cyclodextrine complex. This was deemed necessary because analytical methods could not easily distinguish the inclusion complex from a physical mixture. Upon approval, the mixture will be evaluated as a tetramethylpyrazine release agent.

II. PROJECT EXTRA

A. **Objective**: To develop proprietary flavor additives for enhanced flavor perception in low delivery cigarettes.

B. **Results**:

(1) CR-2643. In anticipation of a need for increased quantities of this compound, reaction conditions to optimize the yield have been developed. A 10-gram sample is available for extended evaluations. The stereochemical isomers have been separated by HPLC and the configuration of each isomer is being established.

(2) Hydroxycyclopentenones. The synthesis of these smoke components is in progress at VCU. An initial attempt to carry out a 3-step sequence without isolating intermediates gave low yields of the desired products. The reaction sequence has been repeated with isolation of intermediates in an attempt to improve yields.

(3) Alkenylpyrazines. The ready availability of acyl pyrazines has occasioned an investigation of their reactions with Wittig reagents to give novel alkenylpyrazines. This previously unexplored class of compounds offers potential for proprietary flavorants. Thus, reaction of 2-acetylpyrazine with 1-triphenylphosphoranylidene-2-propanone in refluxing toluene gave a 65% yield of 2-(2-pyrazinyl) pent-2-en-4-one. Similarly, reaction of acetylpyrazine with triethyl phosphonoacetate gave ethyl 3-(2-pyrazinyl)-2-butenoate.

(4) Acylpyrazines. Free radical acylation of dimethylpyrazines under standard conditions gave the following acylation products:

a. 1-(3,6-Dimethyl-2-pyrazinyl)-2-methyl-1-butanone
b. 1-(3,6-Dimethyl-2-pyrazinyl)-1-butanone
c. 1-(3,6-Dimethyl-2-pyrazinyl)-1-ethanone
d. 1-(3,6-Dimethyl-2-pyrazinyl)-1-propanone
e. 1-(3,5-Dimethyl-2-pyrazinyl)-1-propanone
f. 1-(2,3-Dimethyl-2-pyrazinyl)-1-propanone

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(5) Alkylpyrazines. The reduction of acylpyrazines under Wolff-Kishner conditions gave essentially quantitative yields of the alkypyrazines for flavor evaluation and bio-assay by ants. The following have been prepared:

a. 2,5-dimethyl-3-ethylpyrazine
b. 2,5-dimethyl-3-n-butylpyrazine
c. 2,6-dimethyl-3-ethylpyrazine
d. 2,5-dimethyl-3-n-propylpyrazine

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PROJECT NUMBER: 2525
PROJECT TITLE: Tobacco Chemistry
PROJECT LEADER: R. R. Izac
PERIOD COVERED: June, 1988

I. NATURAL PRODUCTS CHEMISTRY

A. **Objective**: To isolate, identify and/or analyze natural compounds with major emphasis on tobacco and tobacco products.

B. **Results**: Separations of a Bright tobacco subfraction using countercurrent chromatography (CCC) were continued this month. Two on the semi-preparative column (1.6mm I. D., 320 mL capacity) and two on the preparative column (2.6mm I. D., 390 mL capacity).

C. **Plans**: Continue fractionation of Bright tobacco extract fractions and purification of specific compounds.

D. **References**:
1. Core, M. Notebook No. 8608.

II. LOW NICOTINE

A. **Objective**: To examine characteristics of unextracted nicotine.

B. **Results**: Grafted tobacco on a tomato rootstock appears to contain only extractable nicotine. A study of nicotine in grafted material was proposed. Seeding of the plants was begun.

C. **Plans**: Continue to investigate genetic and cultural factors which influence the amount of unextracted nicotine in tobacco materials.

D. **References**: 1. Izac, R. Notebook No. 8632.

III. GREENHOUSE STUDIES

A. **Objective**: To maintain the R&D greenhouses, to conduct plant research studies and to provide greenhouse-grown tobacco materials for support of other R&D programs.

B. **Results**: The harvest of roots from Group 12 of the hydroponic Burley 21 plants has begun. Beginning with Group 13, there will be 52 plants grown per group. Group 13 was placed in hydroponic culture and all plants show good color and growth.

The Oriental plants (Samsun) at the Whiteville, N.C. Tobacco Research Station continue to do well. This study is for the production of U.S. grown Oriental tobacco under specified cultural practices.

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The greenhouse maintenance operations including seeding, transplanting, nutrient solution preparation and other cultural tasks were completed.

C. **Plans**: Increase production of fresh root tissue by hydroponic culture. Monitor the field plots as needed.

D. **References**:
1. Bass, R. Notebook No. 8607.
2. West, G. Notebook No. 8559.

V. SUPPORT ACTIVITIES

A. **Objective**: To provide requested assistance for special projects.

B. **Results**: 1. About 180g of CR 2085 was synthesized. 2. Seven central pith wood core cigarettes were hand made for smoking studies. The cigarettes contained 2R1 filler with a 4mm x 85mm elder wood pith core. Three cigarettes containing radioactive components were prepared for smoking studies.

C. **Plans**: Continue production of CR 2085 (200g required).

D. **References**:
1. Izac, R. Notebook No. 8632, p. 20.

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PROJECT NUMBER: 6502
PROJECT TITLE: Environmental Tobacco Smoke
PROJECT LEADER: C. E. Thomas
WRITTEN BY: M. E. Parrish
PERIOD COVERED: June, 1988

I. QUANTITATION OF BENZENE AND TOLUENE IN MS AND SS CIGARETTE SMOKE

A. Objective: To determine benzene and toluene MS and SS deliveries of cigarette models with and without $Mg(OH)_2$ paper at 17, 20 and 24.8mm circumference.

B. Results:

The MS deliveries of benzene were 40, 66 and 91 ug/cigt. for the 17, 20 and 24.8 mm circumference control models, respectively, and 47, 65 and 97 ug/cigt. for the 17, 20 and 24.8 mm circumference $Mg(OH)_2$ models, respectively. The MS toluene deliveries (reporting in the same sequence as above) were 60, 100 and 150 ug/cigt. for the controls and 90, 100 and 145 ug/cigt for the $Mg(OH)_2$ models.

The SS deliveries of benzene were 200, 250 and 350 ug/cigt. for the controls and 225, 295 and 410 ug/cigt. for the $Mg(OH)_2$ models. The SS deliveries of toluene were 415, 540 and 800 ug/cigt. for the controls and 435, 560 and 865 ug/cigt. for the $Mg(OH)_2$ models. SS data were calculated based on the amount of tobacco and paper consumed which allowed more precise interpretation of the results.

C. Conclusions: Based on the results obtained from five (5) replicates for each sample, the SS deliveries (mg/g) of the $Mg(OH)_2$ models were lower for toluene and slightly higher for benzene relative to the respective controls. Although these differences are in the range of 5 to 10%, the trends are in opposite directions. The calculation of toluene/benzene ratios for the six (6) samples using SS deliveries in mg/g units revealed that the $Mg(OH)_2$ models have lower ratios relative to their respective controls. These values for toluene/benzene ratios are in excellent agreement with the work reported by Johnson and co-workers (1). In addition, their work showed that the ratios decreased as the tobacco pyrolytic temperature increased. Therefore, the SS benzene and toluene measurements suggest that the $Mg(OH)_2$ paper causes an increase in the tobacco temperature of the cigarette. Static coal temperature measurements show a 30°C decrease for cigarettes made with $Mg(OH)_2$ paper compared to controls, while their are no clear differences in the dynamic coal temperature measurements (2). Physical temperature measurements may not be sensitive or accurate enough to observe the pyrolytic temperature changes suggested by Johnson's "chemical thermometer" (toluene/benzene ratio data). Additional experiments would be required to verify these observations since the data were a result of one model system and also were based on five (5) smoke determinations per sample.

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In regards to the effect of circumference on the SS smoke deliveries, it appears that the 17 and 20 mm control models are very similar for both benzene and toluene. The benzene and toluene SS deliveries (mg/g) of these two models are higher than the 24.8 mm control model by 10 and 15%, respectively. A detailed memo will be issued discussing this work.

D. **Plans**: Benzene and toluene measurements will be performed on selected reference cigarettes in support of the SS program. An HP 5880 gas chromatograph should be available in July and it will be set-up and optimized for the procedure.

E. **References**:

1. Johnson, W. R., Hale, R. W., Nedlock, J. W., Grubbs, H. J. and D. H. Powell, "The Distribution of Products Between Mainstream and Sidestream Smoke," TOBACCO SCIENCE, Vol. XVII, pp. 141-144(1973).

2. Oral communication with B. Goodman.

3. Randolph, H. R., P.M. Notebook #8475, p.152.

II. MS AND SS ANALYSES USING TUNABLE DIODE LASER INFRARED SPECTROSCOPY

A. **Objective**: To provide a data base of MS and SS acrolein deliveries for 1988 fabricated 100% single blend component cigarettes.

B. **Results**: The SS deliveries have been determined and for the majority of blend components, the deliveries agree with those previously obtained using the 1984 blend component samples.

C. **Conclusions**: Based on the results of both populations, it appears unlikely that the acrolein SS deliveries can be altered significantly just by changing the percentages of the blend components now being used.

A. **Objective**: Verify earlier observation that acrolein deliveries are reduced with cigarettes having lower glycerine levels in the filler.

B. **Results**: MF blends were fabricated with flavor systems having various levels of glycerine (in cooperation with the Flavor Development Division). A factor of 3 increase in the glycerine content of the filler resulted in a 20% increase in the SS acrolein delivery.

C. **Conclusions**: These results confirm the previous experiments conducted in this project using the TDL acrolein procedure. Based on this work as well as previous work performed at R&D (1), it suggest that acrolein deliveries in SS smoke can be reduced by 10 to 15 % by using blends having low glycerine content (<0.8%).

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D. **Plans**: To complete the information required for the data base, the MS deliveries will be measured for the above mentioned blends and the 100% single blend component cigarettes.

E. **References**:

1. Carpenter, R. D., "Acrolein in Cigarette Smoke," Technical Report No. 204,, Nov. 25, 1960.

2. Parrish, M. E., P.M. Notebook # 8617, pp 64-65.

III. Ambient Monitoring of Environmental Tobacco Smoke (ETS)

A. **Objective**: To quantitate the ambient levels of CO, particulates, and nicotine in environmental spaces using portable monitoring systems.

B. **Results**: An ETS study was implemented and completed in the R&D cafeteria. The samples have been analyzed and all data have been compiled for statistical analysis (in cooperation with the Product Evaluation Division).

C. **Conclusions**: The study was conducted with the help of individuals outside of the project and with little disruption in the cafeteria routine. Preliminary evaluation of the data tends to support published data obtained from similarly designed experiments.

D. **Plans**: CO sensors have been modified and new types have been received and will be evaluated for effects due to physical parameters, such as pressure and relative humidity.

E. **References:**

Baker, G., P.M. Notebook # 8504, p. 62.

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PROJECT NUMBER: 6505
PROJECT TITLE: Special Investigations/Methods Development
WRITTEN BY: D. F. Ingraham
PERIOD COVERED: June, 1988

I. METHODS FOR CASINGS AND AFTERCUTS

A. **Objective**: To develop rapid methods for the quantitation of propylene glycol, glycerin, ethanol, water, and isosweet in casings and aftercuts.

B. **Results**: Standards containing propylene glycol, glycerin, water, and ethanol in the range of 10-50 mg/mL were analyzed on Porapak® QS and Porapak® PS columns using oven temperature programming to optimize peak resolution. While the peaks are resolved on both columns, the efficiency of the PS column is greater than that of the QS column. Analysis times are about seven and eight minutes for the QS and PS columns, respectively. Response (as peak area) of the standards is linear for all four components on both columns. Dilute solutions of top and bright casings were also analyzed on each column. Interferences observed for the bright casing were minimized by modifying the oven temperature program. No interferences were observed for the top casing.

C. **Plans**: Plans are to determine the durability of these columns and to identify an acceptable internal standard.

II. SPECIFICATIONS AND ANALYSIS OF INCOMING BULK LIQUIDS

A. **Objective**: To evaluate the specifications and analytical testing protocol for bulk shipments of propylene glycol, glycerin, isosweet, and ethanol (SD-4).

B. **Status**: Discussions were held with Quality Assurance personnel from Stockton Street, Cabarrus, Park 500, the BL Plant, Louisville, and the Manufacturing Center regarding the following topics: 1) the subjective and quantitative tests currently performed for acceptance of bulk liquids, 2) the tests which are deemed important, 3) the significance of the associated specifications, 4) the tests desired to ensure the quality of the materials, and 5) the instrumentation available in each of the laboratories. This information is being collated on a spread sheet for evaluation.

C. **Plans**: A discussion with personnel from the Flavor Center has been tentatively planned for the week of June 27th. The information gathered will then be issued to the respective facilities for review and additional comments. Following, a meeting will be held with personnel from all locations to discuss the overall evaluation and to establish a standard testing protocol for these bulk liquids.

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III. PROJECT ART

A. **Objective**: Provide analytical support to project ART.

B. **Results**:

The study of the statistical distribution of the amount of ART extracted nicotine from 25 ART runs has been completed. The data have been reported to ART personnel for statistical analysis.

A study was completed on the distribution of nicotine in ART extracted filler as a function of its position in the extraction vessel. Generally, higher levels of nicotine were observed at the top relative to the bottom of the basket.

A series of experiments were performed which showed that over a range of 6% to 40% OV, the higher the water content of the filler, the shorter the extraction time required to extract the nicotine (methanol/ammonia was the extracting solvent). At 10% OV, a three hour extraction yielded 95% of the nicotine extracted at 20% and 40% OV after a one hour extraction. Above 20% OV, extraction times above one hour did not improve the extraction efficiency.

As part of the unextracted nicotine project, many samples were analyzed for nicotine in cooperation with W. Hempfling. One conclusion from this work is that extraction of ART extracted filler with 1 Normal sodium hydroxide at 90 degrees C for 48 hours resulted in approximately 25% more nicotine than off-line pyrolysis of the same. This work will be continued with analysis of the water-washed, filler residue for nicotine; both by extraction and pyrolysis methods.

IV. ANALYSIS OF RESIDUAL SOLVENTS IN PACKAGING MATERIALS

A. **Objective**: To provide headspace analyses for residual solvents from packaging materials and develop a QA method for the routine analysis of packaging materials.

B. **Results**: A draft of the method for residual solvent analysis has been written and is under review. Currently, submitted samples are being analyzed by project 6505 and QA to ensure consistent results can be obtained.

C. **Plans**: Finish preparation of written method and continue running duplicate samples at both locations until consistent agreement is achieved.

V. RESPONSE TO ANALYTICAL REQUESTS

A. **Objective**: To provide analytical support to R&D and Operations personnel and projects.

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B. **Results**:

Analyses and investigations by the project personnel during the month of June included:

A flavor was analyzed for CF content. No CF was detected.

Eight packs of Marlboro were analyzed for ethanol content as part of Marlboro Standardization. Ethanol values ranged from 69 to 207 µg/cigarette.

Four customer complaint samples were received and analyzed for possible contaminants. The results were reported to QA.

Samples of Chewbacco Nicotine gum were subjected to various analyses as part of an overall attempt to determine the contents of the gum. The average nicotine concentration was 0.45 mg/piece (one piece weighed about 1.0 g) before chewing and 0.010 mg/piece after chewing for one half hour. Metal analysis by XRF showed primarily Ca and Ti. The amount of tobacco material in the gum was estimated to be less than 1% by weight. Determination of glycerin, PG, and triacetin gave 0.27%, 0.05%, and 4.2%, respectively. GC/MS analysis of an extract of the gum showed the balance of the volatile material to be mainly hydrocarbons, plus smaller amounts of acetate esters and other unidentified compounds.

The amount of methoprene delivered to MS smoke was determined on PM Super Lights (Japan) after application at the 5 ppm level. Analysis by GC/MSD-SIM showed the delivery to be 0.22 µg/cigarette analyzed on a Cambridge pad, reflecting a 7.3% MS delivery.

Sixty samples from B. Jenkins' MS/SS evaluation were analyzed for nicotine.

Six tower gas samples from M/C and Cabarrus were analyzed for glycerin and nicotine in order to try to define process differences between the two locations.

C. **References**:

1. Ingraham, D. F., "CC 880513090, Control No. 88032 - Marlboro Lts FTB - Mark Lauley," memo to Cindy Spielberg, May 31, 1988.
2. Ingraham, D. F. and Shelton, J. H., "CC 880505011, Control No. 88029 - Marlboro Lts Menthol 100's HP - Elyse Brook," memo to Cindy Spielberg, June 3, 1988.
3. Ingraham, D. F. and Shelton, J. H., "Control No. 88030 - Cambridge Lts Menthol 100's - D. Hugh Davis," memo to Cindy Spielberg, June 3, 1988.
4. Ingraham, D. F. and Shelton, J. H., "CC 880526011, Control No. 88036 - Marlboro KS - Pamela Thorn," memo to Cindy Spielberg, June 17, 1988.
5. Kanipe, B., "CHEWBACCO Gum - 'Tobacco' Content," memo to B. Handy, June 10, 1988.

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PROJECT NUMBER: 6906
PROJECT TITLE: Biological Effects of Smoke
PROJECT LEADER: J. M. Penn
WRITTEN BY: L. H. Thompson and G. J. Patskan
PERIOD COVERED: June, 1988

I. PROTEIN KINASE C (PKC) WHOLE CELL ASSAY: EFFECTS OF TPA and CSC

A. **Objective**: Evaluate the effects of 12-O-tetradecanoyl-phorbol-13-acetate (TPA) on protein phosphorylation in quiescent 3T3 cells.

B. **Results**: TPA increased protein phosphorylation in cells grown in both standard and high glucose media. However, the cells grown in high glucose media exhibited a greater response than cells grown in standard media. A 5 hr incubation with IT 2R1 CSC did not affect protein phosphorylation relative to the solvent control in high glucose 3T3 cells. Results obtained with the standard media were inconclusive.

C. **Plans**: Expand the evaluation of IT 2R1 CSC on cells grown in standard media and high glucose media to include additional incubation times.

D. **References**: Nixon, G. Notebook No. 8569, p. 146.

II. INHIBITION OF EGF BINDING ASSAY: TIME COURSE

A. **Objective**: Determine how the effects of CSC and catechol on EGF binding and cell numbers change with time.

B. **Results**: A second time course experiment examining the 17.5 to 22.5 hr time-span confirmed the results of the first experiment. The effects of IT 2R1 CSC, IT 100% ES CSC and catechol on EGF binding and cell numbers did not significantly change over this time period. Two experiments were conducted which evaluated treatment times from 0 to 7 hr. The inhibition of EGF binding caused by IT 2R1 CSC, IT 100% ES CSC and catechol increased rapidly with time up to 7 hr. However, there were no changes in cell numbers by 7 hr. The effects of IT 2R1 CSC and IT 100% ES CSC were the same throughout the time periods examined. The inhibition of EGF binding and reduction in cell numbers by catechol and CSC followed the same time course.

C. **Plans**: Continue to use the standard 19.5 hr treatment time in future experiments.

D. **References**: Patskan, G. Notebook No. 8664, p. 118.

III. PDBu BINDING ASSAY

A. **Objective**: Determine the effects of catechol and benzo(a)pyrene (B(a)P) on PDBu binding to 3T3 cells.

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B. **Results**: Experiments confirmed previous findings that catechol increased PDBu binding after a 19.5 hr treatment period but had no effect when added at the time of binding. B(a)P produced a weak stimulation of PDBu binding following a 19.5 hr treatment and no effect when administered at the time of binding.

C. **Plans**: Examine the effects of protein kinase C inhibitors on the increase in PDBu binding elicited by CSC.

D. **References**: Ferguson, T.J. Notebook No. 8645

IV. GLUTATHIONE DEPLETION ASSAY (GDA):QUANTITATION of the GLUTATHIONE (GSH) LEVEL in SALMONELLA STRAIN TA98

A. **Objective**: To determine the GSH level in an overnight culture of Salmonella strain TA98.

B. **Results**: Using a modified version of the procedure for GSH extraction currently used in the standard GDA, HPLC analysis indicated the presence of 265 nmol GSH/$6X10^{10}$ TA98 cells. These results compared well to 146 nmol/$6X10^{10}$ cells reported in the literature. The GSSG level at the same cell concentration was found to be 21 nmol vs 9 nmol reported in the literature.

C. **Plans**: To determine at what level 2R1 CSC depletes GSH in strain TA98.

D. **References**: McCoy, W. R. Notebook No. 8555, pp.118-121.

V. GDA: EFFECT OF 2R1 CSC ON THE GSH LEVEL in SALMONELLA

A. **Objective**: To determine the effect of 2R1 CSC on the GSH level in Salmonella strain TA98 as they are used in the Salmonella assay.

B. **Results**: TA98 cells were treated with 2R1 CSC for 0, 1 and 2 hr (37°C in incubator) using an assay protocol similar to that routinely used in the Salmonella assay. The results showed a significant reduction in GSH compared to the solvent (DMSO) control at 0 and 1 hr treatment times (55 and 72% respectively). However, after 2 hr of treatment, GSH recovered to control levels.

C. **Plans**: Determine the effect on the S/M activity of 2-nitrofluorene using TA98 cells which have been GSH depleted by 2R1 CSC.

D. **References**: McCoy, W.R. Notebook No. 8555, pp.118-121.

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VI. SALMONELLA/MICROSOME (S/M) ASSAY -- ADDITION OF d-ALANINE TO 1R4F CONTROL FILLER

A. **Objective**: This experiment was designed to determine if the addition of d-alanine to 1R4F filler would alter the S/M IT CSC activity as compared to the solvent control.

B. **Results**: D-alanine was dissolved in saline and oversprayed onto 1R4F filler at three levels (0.5, 1.0 and 2.0%). The data indicated that 1R4F + solvent control was significantly higher in IT CSC specific activity (S.A.) than that of 1R4F alone. Increasing the concentration of d-alanine in 1R4F increased the IT CSC S.A.s compared to the solvent control. However, there was no significant difference between CSCs from 1R4F filler containing 0.5 and 1.0% added d-alanine.

C. **Plans**: To evaluate the effects of adding various nitrogenous tobacco components to samples in the crossed soluble/baseweb study.

D. **Reference**: Thompson, L. H. Notebook No. 8628, pp. 110-119.

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PROJECT NUMBER: 6908
PROJECT TITLE: Smoke Condensate Studies
PROJECT LEADER: R. D. Kinser
WRITTEN BY: W. R. Morgan
PERIOD COVERED: June, 1988

I. TSNA REMOVAL STUDIES

A. **Objective**: To explore the possibility of extracting TSNA from stored tobacco using an extraction fluid compatible with current processing.

B. **Results**: The extraction of TSNA and alkaloids from filler along with removal of the same constituents from a recirculating extraction solvent stream by Amberlyst-15 cation exchange resin was examined this month. Solvent composition, temperature, flow rate, solvent multiples, and ratio of resin to filler weight were variables. HPLC and GC/TEA methods were used to analyze for alkaloids and TSNA respectively.

Increasing the ratio of resin to filler increased the removal of alkaloid and TSNA. Nicotine and TSNA were extracted almost quantitatively. Minor alkaloids were more difficult to remove. Increasing the percentage of ethanol to hexane and the solvent multiple (total volume) also increased alkaloid and TSNA removal.

Analysis of Cherry Red filler, which is high in minor alkaloids, required modification of the alkaloid analysis procedure. Methanol extraction was replaced by extraction with benzene/chloroform containing aqueous base.

C. **Plans**: Continue the study of the effect of extraction variables on the procedure to minimize the % dry weight loss and enhance minor alkaloid removal. Tests will also be performed to determine if the spent resin can be regenerated for future use.

D. **References**:

Warfield, A. H. Notebook No. 8558, p. 144
Lambert, E. A. Notebook No. 8523, p. 155

II. CIGARETTE CONSTRUCTION PARAMETERS

A. **Objective**: To study the effect of cigarette construction parameters on TSNA in smoke.

B. **Results**: Cigarettes have been obtained which will enable the study of the effects of circumference, paper porosity, paper citrate level, packing density, and filler cut width on TSNA in smoke. Initial studies of 17 mm and 25 mm circumference cigarettes showed no differences in delivery of TSNA into smoke as a function of the amount of filler consumed during smoking.

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C. **Plans**: To continue the investigation of the effect of the other variables on TSNA in smoke.

D. **References**:

Lambert, E. A. Notebook No. 8523, p. 156

III. TSNA PRECURSORS

A. **Objective**: To determine the precursors of MS TSNA.

B. **Results**: A study of the ability of organic nitrites to act as nitrosating agents was conducted using t-butyl nitrite mixed with dihexylamine and anatabine in acetonitrile. Formation of nitrosamines was monitored over several days and the results clearly showed that t-butyl nitrite is an effective nitrosating agent.

Addition of nitrate and anabasine to bright and oriental fillers illustrated that nitrosoanabasine was formed in large quantities. Also nitrate additions to bright and oriental at levels approximating those of burley filler did not produce increases in TSNA to equal the TSNA delivery of burley smoke. These studies were performed in order to test the effects of increased TSNA presursor addition on pyrosynthetic TSNA production and in the case involving oriental filler to determine if a natural inhibitor of TSNA production exists. These results indicate that nitrate is an effective agent for production of nitrosating agents during smoking, but that nitrate alone does not control the final TSNA levels in smoke. This indicates that other factors may be operative in the production of TSNA in addition to the presence of the alkaloid and nitrosating agent precursors. Inter- and intracellular separation of precursors and, in the case of oriental, pyrosynthetic inhibitors may be important factors. Also with oriental filler the addition of large amounts of added alkaloid to the filler may deplete the active inhibiting agent, thus giving the appearance that a natural inhibitor does not exist.

The preparation of the document on nitrosation precursors and reaction mechanisms relating to TSNA pyrosynthesis is in the final editing stages. Recommendations for future studies of nitrosating agents, nitrosation mechanisms, and methods of inhibiting pyrosynthesis are included. Implementation of some of the recommendations has already begun.

C. **Plans**: Continue implementation of the studies recommended in the nitrosation report. Use oriental CEL fractions mixed with alkaloids and nitrite to further investigate the possibility that an inhibitor to TSNA production is present in oriental tobacco.

D. **References**:

Haut, S. A. Notebook No. 8595, p. 88
Tickle, M. H. Notebook No. 8587, p. 163
Morgan, W. R. Notebook No. 8579, p. 46

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IV. SUPPORT FUNCTION: CONDENSATE PREPARATION

A. **Objective**: To fabricate cigarettes, perform smokings, and prepare condensate as needed for biological and chemical analysis.

B. **Results**: Seventy eight smokings of 17 different cigarette codes were performed to yield condensate for various chemical and biological assays.

C. **References**:

Hellams, R. D. and McGee, N. H. Notebook No. 8613, pp.83-84

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PROJECT NUMBER: 0008
PROJECT TITLE: Computer Applications/General Support Group
PROJECT LEADER: G. Davis
PERIOD COVERED: May 20 - June 17, 1988

I. COMPOSER/UNIX TRAINING (G. Davis & J. Lawson)

A. **Objective**: Provide training and support for Unix and the WMC text processing package. Conduct training, user support and implementation of software revisions as they become available. Design WMC customized templates for the R&D Community. Maintain consistency of WMC menus and configuration files across all systems.

B. **Results**: Recompiled the Master and Site Dictionaries including more tobacco terms to alleviate the constant user dictionary size problem. Common dictionaries are now available on all systems. Did a test run for CAD on the WMC database interface to the label program, making recommendations including the creation of a global glossary item which reduced the instructions from 10 pages to 3. Consulted with Marian Debardeleben on creating a WMC database for form output.

Worked with special files for Rhonda Donovan in preparation for converting her to a postscript printer.

C. **Plans**: The General Support Group will continue to hold any Composer Classes and support Composer as necessary. Documentation on the WMC interface to label program will be available on a request basis and a possible class for secretaries/library/Central File will be held. Several new templates have been requested for addition to the WMC menu. Current plans are to create a directory of WMC templates where anyone can copy from that directory.

II. Ful/Text/SCANNER: (G. Davis)

A. **Objective:** Become familiar with the Ful/Text product and the Palantir scanner targeted for Central File to decrease the paper backlog in R&D's warehouse of an estimated 10 million pages. Implement and become resident expert for the above two products. Become familiar with Paint product for enhancing scanned images with the Palantir scanner.

B. **Results:** Created a reprints collection for B. LaRoy. Waiting to confirm Ful/Text training direction from Central File staff. Learned all aspects of SolarPaint. Took a printed image from Interleaf, scanned on the Palantir, rasterized it, brought it up in SolarPaint, made modifications and printed. Have requested twice from Deloris specific jobs she has in mind in order for me to evaluate SolarPaint as a possible package for Central File. Still waiting for her response. Scanned images for Miles and Trish. Scanned several pages of CCTS with the Palantir in hopes

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of getting clean data on-line for Maggie Southwick. First pass of this data was very poor.

C. **Plans:** Continue support on above. Continue learning about Ful/Text in regards to customization. Conduct Ful/Text training and determine support needs for Central File. Further work will be done after receiving word from Deloris. Teach Trish how to scan.

III. **BASIS (G. Davis, J. Lawson & S. Jensen)**

A. **Objective:** Provide back-up for Alice Lewis in Basis database design and support. Continue to support Engineering Department Central File in database usage.

C. **Results:** (S. Jensen) We have partially resolved the problem of the Phantom spaces that have shown up in the engineering docs database. The fix was initiated. The data is now clean and searches produce valid results, however, a "look" on the affected fields still displays the phantom spaces. Apparently there is a link somewhere in basis that was not broken with the fix we did. This will be pursued further.

Once again we had a major problem with the /tmp/basislocks file. After smaug took a partial crash, this file was destroyed. The users who were in basis did not realize anything had happened until they tried to exit and could not. We were able to kill their processes and restore order, however, Marian Debardeleben lost a weeks worth of work.

The MES and MATER databases have been converted from the 700.

C. **Plans:** To remain accessible to the basis users. To move Central File's databases from rmnt2 to usr/hd/smaugh7.

IV. **SOFTWARE: (G. Davis & J. Lawson)**

A. **Objective**: Evaluate new software as needed such as Interleaf, Centrum, Alice, Ful/Text, ProChart, Profs.

B. **Results:** SolarPaint has been investigated as a possible graphics package for Central File. Profs has been taught to all secretaries whose Manager/Director has an account. Worked with IS in getting Manuel Bourlas set up with equipment to use PROFS while he is in the states for this month. Recreated the Philip Morris Pop-Up menu in Interleaf. This menu somehow got trashed in the Sun conversions. Worked on a very limited scale with ProChart. Starting going through the Centrum Quick-Start documentation working with Centrum.

C. **Plans:** Support any of the above products as they become production. Evaluate software as it becomes available on the system.

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V. PED SUPPORT (S. Jensen)

A. Objective: Provide programming and maintenance support in C language to the R&D staff as needed.

B. Results: The recent project request for a program to support the newly created sidestream panel has produced some major ramifications that will effect the current structure of the smoking and odor panels. At a meeting with Melissa Jeltema, Loraine Watt, and myself it was determined that a consolidated point system was needed among the three panels. There are many panelists who are on more than one panel. Because of this, the programs needed to administer the awarding of points and selecting of gifts without a consolidated point system would be difficult to write and maintain.

The current concept of each panel existing as a separate entity needs to be replaced with the concept of a single system. In this system some files and programs would be shared while others would remain unique to each panel. The object of this restructuring is to make the system more flexible and easier to maintain. It will be easier to maintain because the system concept will result in the consolidating or eliminating of programs currently needed to support the individual panels. Also, all data files will be structured identically, allowing for easy program changes or system expansion. Finally, the system concept will allow for greater flexibility in future expansion of new types of panels and deletion of old.

Two of the new programs have been written, demoed, modified as the result of the demo and delivered to the user.

Time was spent this month helping Fay West in creating and printing labels and ballots using the Label and Ballot programs. Some minor bugs were found and resolved, overall both programs are running very well in the user community.

C. Plans: To continue with the rework of the PED panels from the concept of individual entities to a single system. To continue support and maintenance of develoPED programs.

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PROJECT NUMBER: 8101
PROJECT TITLE: Cigarette Testing Services Division
SECTION LEADER: Joyce F. Stargardt
PERIOD COVERED: June, 1988

I. MARKET ACTIVITY

A. Objective: To monitor and report new brand introductions and brand modifications for the domestic and international cigarette markets.

B. Results:

1. International

MidWest 85 (Box) cigarettes, manufactured by MidWest Tobacco Co. of Fairfax, Virginia, were obtained from Greece. This cigarette delivers 19 mg tar and 1.2 mg nicotine, and the blend does not contain any reconstituted tobacco, expanded tobacco or expanded stems. The packaging of this product is similar to Marlboro 80 (Box).

Fairfax 85 Anisette cigarettes are being manufactured by G. A. Georgopulo & Co., Inc. of New York. These cigarettes were purchased in Switzerland. This cigarette delivers 19 mg tar, 1.3 mg nicotine and 0.4 mg anethole in smoke. The filter is a plug-space-plug configuration and the space contains granules impregnated with anethole.

2. Japanese Market - New Brands

Camel Mild King Size cigarettes deliver 10 mg tar and 0.7 mg nicotine and are manufactured by R. J. Reynolds. This brand is similar in both physical and smoke characteristics to Islands Lights recently introduced by Reynolds in Japan.

John Player Special Milds King Size cigarettes deliver 12 mg tar and 0.8 mg nicotine and are manufactured by BAT.

Sometime Miass 100 Menthol cigarettes deliver 9 mg tar, 0.8 mg nicotine and 0.4 mg smoke menthol. This is a slim cigarette (23 mm) and "Miass" is an acronym for Marble Image Art of Sometime Slim.

II. ANALYTICAL METHODS DEVELOPMENT AND SUPPORT

A. Objective: To evaluate and recommend analytical methods and new technology in support of programs for R&D and Manufacturing.

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B. **Results**:

1. Comparison of Tobacco Institute of Japan (TIOJ) vs. FTC Tar

Tar and nicotine data reported by the Tobacco Institute of Japan (TIOJ) for 31 brands were compared to Philip Morris tar and nicotine data. TIOJ data averaged higher than PM data. Empirical regression curves showing the relationship of TIOJ to PM tar and nicotine deliveries have been established. The formula for these regression curves is as follows:

$y = ax + b$

where x = Philip Morris (FTC) observed value
y = TIOJ predicted value

Tar: $y = 0.92x + 1.87$
Nicotine: $y = 0.89x + 0.12$

2. Tobacco Institute Testing Laboratory (TITL)

The Tobacco Institute Testing Laboratory (TITL) is the official source of "TAR" and nicotine data for the tobacco industry. The Federal Trade Commission Laboratory closed in February, 1987. Under the agreement between TITL and FTC, Mr. H. Pillsbury of the FTC staff will have free access to the facilities and data of TITL.

The first market survey under the auspices of TITL was published in April, 1988. Differences in tar, nicotine, and CO data were observed between TITL and Philip Morris laboratories. Representatives from each company supporting TITL will review current procedures and conduct comparison studies biannually.

3. Humectants in Smoke

Data for glycerin and propylene glycol in smoke were generated for 28 Philip Morris brands. Testing will continue to include all Philip Morris brands as well as representative brands from competitors. To date, the following six Philip Morris brands have the highest glycerin in smoke level:

	Glycerin, mg/cigt.	Propylene Glycol, mg/cigt.
Marlboro 85	1.4	0.8
Marlboro 85 25's	1.4	0.8
Marlboro 100	1.4	0.8
Benson & Hedges 100 (Box)	1.5	0.6
English Ovals 85 (Box)	1.8	1.0
Philip Morris Commander	1.8	1.2

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